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Erysimum hedgeanum (Brassicaceae), a New Name Replacing *Arabidopsis erysimoides*

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ABSTRACT. *Erysimum hedgeanum* is a new name proposed to replace the later homonym that would result from the transfer of *Arabidopsis erysimoides* to *Erysimum*.

During the past decade, increasing interest in *Arabidopsis* resulted from the selection of one of its species, *A. thaliana* (L.) Heynhold, as the model flowering plant in basic and applied research in molecular genetics, developmental biology, plant physiology, evolution, and other fields. The species has been recently named by Patrusky (1991) as the "Drosophila botanica or the fruit fly of plant biology," and the outstanding features for its selection as a model organism have been covered by many reviews. The interested reader should consult Meyerowitz (1989) and references therein.

Arabidopsis is one of the most poorly defined and artificially delimited genera of the Brassicaceae (Cruciferae) (Al-Shehbaz, 1988; Hedge & Tan, 1987). Critical evaluation of the generic disposition of species previously assigned to *Arabidopsis* is needed. Biosystematic and phylogenetic studies of *Arabidopsis* and its generic relatives are well underway at the Missouri Botanical Garden. The present paper deals with one of the problematic species, which for the reasons below should be assigned to the genus *Erysimum*.

Erysimum hedgeanum Al-Shehbaz, nom. nov. Replaced name: *Arabidopsis erysimoides* Hedge & Kit Tan, Pl. Syst. Evol. 156: 202. 1987; not *E. erysimoides* (Karelin & Kirilov) Kuntze, Rev. Gen. 2: 933. 1891 [listed as *E. erysimodes* but was based on *Arabis erysimoides* Karelin & Kirilov]. TYPE: Saudi Arabia. Hail to Jabbah road, Najud, between Qulban & Qana, sand dune, 900 m, 9 Mar. 1986, *I. S. Collenette 5713* (holotype, E; isotype, K).

Erysimum hedgeanum, which is named in honor of Ian C. Hedge (Royal Botanic Garden, Edinburgh), an outstanding student of the Brassicaceae and the senior author of *Arabidopsis erysimoides*, was originally described in *Arabidopsis* mainly because its authors (Hedge & Tan, 1987: 202) concluded that "A thorough herbarium and literature search in *Erysimum* failed to reveal any species that was at all like the Arabian plant and our conclusion was that it could not be described as a new species in *Erysimum*. Dr. Adolf Polatschek (Natural History Museum, Vienna) to whom we sent some material for examination also concluded that it could not be described as a new species in *Erysimum*." However, no reasons were given to justify its exclusion from *Erysimum*. The closely appressed medifixed trichomes of *E. hedgeanum* are characteristic of many species of the genus, and the "unusual" combination of linear-filiform leaves and reflexed fruits are indeed found in several species of *Erysimum*. In fact, *E. hedgeanum* shares with *E. sisymbrioides* C. A. Meyer, another annual member of the genus, all the basic characters of indumentum, flower, and fruit morphology that definitely support their placement in *Erysimum*. The characters of the leaves and fruits used by Hedge & Tan (1987) to exclude the species from *Erysimum* can also be used to exclude it from *Arabidopsis*. In fact, no species of *Arabidopsis* or its related genera have the trichome type of *E. hedgeanum*. Medifixed appressed trichomes are

found in other genera of the Brassicaceae (e.g., *Lobularia* Desvaux, *Weberbauera* Gilg & Muschler, *Farsetia* Turra), but in all these cases either all species of the genus have the same trichome type or, in the case of *Weberbauera* (Al-Shehbaz, 1990), trends of the evolution to medifixed trichomes are found.

In my opinion, every aspect of *Erysimum hedgeanum* supports its placement in *Erysimum* and not in *Arabidopsis*. The absence of a very close relative of this species does not justify its exclusion from *Erysimum* nor does it support its placement in a new genus. Furthermore, Hedge & Tan's (1987) argument that *E. hedgeanum* (as *A. erysimoides*) shares with *Arabidopsis* a similar habit, nonsaccate sepals, small petals, incumbent cotyledons, and readily dehiscent many-seeded fruits can be misleading because this combination of characters is common elsewhere in the Brassicaceae, including *Erysimum*, and must have evolved independently several times. The presence of appressed, medifixed, 2-branched trichomes oriented parallel to the long axes of all exposed parts of the plant (excluding petals and stamens) is a typical feature of *Erysimum* (Price, 1987) and should therefore receive more weight in the generic placement of this species.

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Literature Cited

Al-Shehbaz, I. A. 1988. The genera of Sisymbrieae (Cruciferae; Brassicaceae) in the southeastern United States. J. Arnold Arbor. 69: 213–237.

———. 1990. A revision of *Weberbauera* (Brassicaceae). J. Arnold Arbor. 71: 221–250.

Hedge, I. C. & K. Tan. 1987. Two remarkable new Cruciferae from Saudi Arabia. Pl. Syst. Evol. 156: 197–206.

Meyerowitz, E. M. 1989. *Arabidopsis*, a useful weed. Cell 56: 263–269.

Patrusky, B. 1991. Drosophila botanica (the fruit fly of plant biology). Mosaic 22(2): 32–43.

Price, R. A. 1987. Systematics of the *Erysimum capitatum* alliance (Brassicaceae). Unpublished Ph.D. Dissertation, University of California, Berkeley.

New Species and Combinations of *Catostemma* and *Pachira* (Bombacaceae) from the Venezuelan Guayana

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ABSTRACT. Julian A. Steyermark had completed an extensive study of the Bombacaceae of southern Venezuela, but died before he was able to complete a treatment for the *Flora of the Venezuelan Guayana*. This paper lays the final groundwork for publication of this treatment and includes two new species, *Catostemma durifolius* and *Pachira yapacanae*, and nineteen new combinations in *Pachira*, into which all Venezuelan Guayanan species of *Pochota*, *Bombacopsis*, and *Rhodognaphalopsis* are placed.

CATOSTEMMA AND RELATIVES

Catostemma Bentham is a small genus of 10–14 species found in forests of northern Brazil, southern Venezuela, the Guianas, and Colombia (Steyermark, 1987; Paula, 1969). This genus and the closely related *Aguiaria* Ducke (1 species) and *Scleronema* Bentham (4–5 species) are placed in the tribe Catostemmatae of the Bombacaceae, based on their unifoliolate-compound leaves, few(1–4)-seeded fruits, and their largely free staminal filaments (Hutchinson, 1967). After reading a description of the palmately compound juvenile leaves of *Catostemma commune* Sandwith (Sandwith, 1931), Hutchinson surmised that the adult leaves of *Catostemma* were unifoliolate-compound. A more recently discovered species, *Catostemma digitatum* J. D. Shepherd & W. S. Alverson, retains palmately compound (i.e., polyfoliolate) leaves into adulthood (Shepherd & Alverson, 1981). In contrast, no palmately compound juvenile or adult individuals of *Aguiaria* and *Scleronema* are known, but Hutchinson concluded that both genera were unifoliolate because of the swollen distal pulvinus on each petiole, a morphological trait shared by all three genera. However, as fresh material of other genera of Bombacaceae has become available in recent years, it is clear that most neotropical taxa share this trait. Thus, a swollen distal pulvinus cannot be used as a synapomorphy for the Catostemmatae.

Nevertheless, similarities of flower and pollen structure (cf. Nilsson & Robyns, 1986) probably indicate a close relationship among all three genera. Affinities to other Bombacaceae and Malvales are much less clear.

During preparation of the Bombacaceae treatment for the *Flora of the Venezuelan Guayana*, the following material could not be identified with keys in Paula (1969) or Steyermark (1987).

Catostemma durifolius W. S. Alverson, sp. nov. TYPE: Venezuela. Bolívar: along Río Sarven between camps 3 and 4, slopes and talus forest, Sarvén-tepuí, 1,400 m, 10 Jan. 1953 (fr), *Wurdack 34085* (holotype, WIS; isotype, NY not seen).

Arbor 9–40 m; *petiolis* 2–5.5 cm longis; *foliorum laminis* oblongis ovatis ellipticis vel obovatis duris rigidis corrugatis apice obtusis vel rotundis basi subcordatis vel rotundatis 17–32 cm longis 8–16 cm latis super glabris vel sparsim lepidotis subtus dense lepidoto-tomentulosis pilis munitis; *pedicellis* ca. 3 mm longis; *bracteolis* 2–3; *calyce* ellipsoideo 16–22 mm longo; *petalis* obovatis ca. 22 mm longis 9–10 mm latis albis; *staminibus* minimum 100, tubo staminali ca. 3 mm longo, partibus liberis 10–15 mm longis; *stylo* ca. 23 mm longo infra medium stellato-tomentoso; *fructu* ellipsoideo 4–5 cm longo 2–3 cm lato; *semine* crasso-fusiformi vel ovoideo 4–5 cm longo 2–3 cm lato.

Tree, 9–40 m tall. *Young branches* glabrous or glabrate. *Bud scales* keeled, densely lanate-tomentose with stellate trichomes. *Petioles* 2–5.5 cm long, densely tomentose or tomentulose, glabrate. *Leaf blades* oblong, ovate, elliptic or obovate, rigid, very hard, corrugate between lateral nerves, rounded or obtuse at apex, subcordate or rounded at base, 17–32 cm long, 8–16 cm wide, glabrous or sparsely lepidote with minute, dark brown, stellate trichomes above, densely lepidote-tomentulose with pale golden to dark reddish brown stellate trichomes below; midrib elevated below; basal secondary nerves 3–5; lateral secondary nerves 8–11 per side, deeply impressed above, prominent beneath, uniformly ascending at an angle of 45–50°, 1–4.5 cm distant, conspicuously brochidodromous toward tip of leaf;

tertiary venation impressed above, distinctly elevated beneath, subparallel, forming a somewhat regular pattern. *Pedicels* ca. 3 cm long, densely stellate-tomentose, bracteolate; bracteoles 2–3, subtending calyx, deltate to widely ovate, at tip acute or mucronate, 2–3 mm long and wide, reportedly brownish green when fresh, densely stellate-tomentose except the sometimes glabrous apices. *Calyx* 16–22 mm long, tearing for half or more of length into 2–3 broad lobes, densely stellate-tomentulose without, glabrous within except for the stellate-strigose apex. *Petals* obovate, obtuse or retuse at apex, ca. 22 mm long, 9–10 mm wide, white when fresh, reddish brown when dry, densely stellate-tomentose without, glabrous within except for the stellate-pilose apex. *Stamens* 100 or more, reportedly white when fresh; filaments fused at base into a tube ca. 3 mm long, free above tube for 10–15 mm; anthers ca. 1 mm long. *Ovary* semi-inferior, rhomboid-ellipsoid, densely stellate-tomentose. *Style* ca. 23 mm long, stellate-tomentose in lower ½, glabrous above; style branches 2–3 mm. *Fruit* ellipsoid, faintly to strongly costate longitudinally, apparently unilocular, 1(occ. 2?)-seeded, reportedly chestnut brown when fresh, densely tomentose or tomentulose with dark brown stellate-echinate trichomes. *Testa* 1–2 mm thick, dark brown. *Seed* thick-fusiform or ovoid, 4–5 cm long, 2–3 cm diam., rugulose, ebony, apparently surrounded by thick orange or brown sap produced within the testa.

Known only from upper elevation forests in southeastern Bolívar, Venezuela, *Catostemma durifolius* differs from its congeners by its rigid, very hard, corrugate leaves that are densely lepidote-tomentulose with stellate trichomes beneath. Comments on the collection labels suggest that this species is very common where it occurs, yet few collections have been made to date. Common name: Chimanayek (*Hernández 500, 520*).

Paratypes. VENEZUELA. **Bolívar:** Flanco este del Roraima Tepuy, 05°08′N, 60°43′W, 1,530 m, 29 Apr. 1987 (fl), *Hernández 500* (MO); unos 6 km al NW del Cerro El Sol, 05°02′N, 60°38′W, 1,450 m, 3 May 1987 (fr), *Hernández 520* (MO).

Pachira and Relatives

For nearly 30 years, André Robyns's monograph of *Bombax* L., sensu lato, has been the authoritative work on the taxonomy of a number of neotropical segregate genera, including *Bombacopsis* Pittier, *Eriotheca* Schott & Endlicher, *Pachira* Aublet, *Pseudobombax* Dugand, and *Rhodognaphalopsis* A. Robyns (Robyns, 1963). Two paleotropical genera, *Bombax* L. and *Rhodognaphalon* (Ulbrich) Roberty, were also included in this work.

Examination of the neotropical genera, however, suggests several problems with the segregation of *Rhodognaphalopsis* from *Bombacopsis*, the segregation of both genera from *Pachira*, and the relationship of *Pseudobombax* and *Rhodognaphalon* to these other genera. The problems stem from three underlying issues: (1) disagreement about the utility of palynological characters; (2) lack of reasonably complete morphological information for each of the taxa; and (3) cladistic concerns.

(1) The problem with pollen

Robyns relied heavily on palynological characters to separate neotropical genera. Of the five neotropical segregates of *Bombax* recognized by Robyns, only *Eriotheca* and *Pseudobombax* were separated on macromorphological characters: small flowers (< 6 cm long) and inarticulate leaflets (i.e., having petiolules without a suture at the point of attachment to petiole), respectively. He distinguished *Bombacopsis* from *Rhodognaphalopsis* solely on palynological characters. Species with colpate or colporate pollen with a reticulate sexine without spines were put in *Bombacopsis*. Species with porate or pororate pollen with a structurally uniform and uninterrupted (tegillate) or minutely perforated (punctitegillate) sexine with projecting spines or rods (bacculae) were placed in *Rhodognaphalopsis*.

Steyermark & Stevens (1988) rejected a distinction between the two genera by palynological criteria and argued that the pollen of *Rhodognaphalopsis* could be easily accommodated within the variability of pollen characters seen in the eurypalynous *Bombacopsis*. My view is that these pollen criteria can, but should not, be used to separate the two genera for a number of reasons. Separation of the two genera causes serious practical problems with the identification of specimens while providing little insight into phylogeny or evolution. As pointed out by Steyermark and Stevens, the pollen characters do not correlate with any macromorphological features. Thus, generic keys are nearly impossible to construct for fruiting or sterile material. Removal of *Rhodognaphalopsis* does little to reduce the morphological heterogeneity of *Bombacopsis* or to define the latter as a coherent evolutionary group (i.e., a clade). While it is possible that further studies may demonstrate that "rhodognaphalopsoid" pollen indicates a monophyletic clade within the Bombacaceae, such a clade could just as well be represented at a sectional, rather than generic, level. Until it can be shown that palynological characters are a

superior guide to phylogeny in the group, macromorphological characters should take precedence for their utilitarian value in classification (cf., Alverson, 1989).

In view of these considerations, I have followed Steyermark and Stevens in rejecting a generic distinction between *Rhodognaphalopsis* and *Bombacopsis*.

(2) THE PROBLEM WITH *PACHIRA*

An additional problem encountered in the preparation of the treatment for Bombacaceae is the separation of the genus *Pachira* from *Bombacopsis*. Robyns's key to genera (1963: 27–28) shows an almost complete overlap in characters between these genera, except in pollen characters and the structure of the seedlings. If *Bombacopsis* is taken in the broad sense (i.e., as inclusive of *Rhodognaphalopsis*), the pollen characters no longer distinguish *Bombacopsis* from *Pachira* (because *Pachira* pollen is intermediate), and only seedling differences remain.

Pachira aquatica Aublet has peculiar seedlings adapted to aquatic float dispersal (figs. 10, 11 in Robyns, 1963: 239, 240; figs. 1–7 in Lynch, 1880: 149). The cotyledons are greatly unequal. One is reduced to a broadly deltoid scale or a small, foliose structure, and the other is a very large, thick, fleshy ring that surrounds the stem axis. Both are photosynthetic and lie on the ground (hypogeal) or are slightly elevated (epigeal), and only partially emergent from the testa (partially cryptocotylar). In contrast, the seedlings of *Bombacopsis glabra* (Pasquale) A. Robyns more closely resemble the majority of the seedlings known in the Bombacaceae and related families (fig. 7 in Robyns, 1963: 211; fig. 4 in Piccolo, 1981). The cotyledons are unequal, but less so than those of *P. aquatica*, epigeal, and emergent from the testa (phanerocotylar), though still somewhat fleshy.

Robyns's use of seedling structure as a criterion to separate *Bombacopsis* and *Pachira* was premature, given that his monograph (1963) included data on the seedling morphology of only 2 of the 22 species he attributed to these genera (or 3 of 31, if the species of *Rhodognaphalopsis* are included). A subsequent paper with 10 new species of *Bombacopsis* and *Rhodognaphalopsis* (Robyns, 1967) did not provide additional information on seedling morphology. Sorting species into these genera was not and still cannot be done by using his seedling criteria, because the information is not available. In subsequent years, the seedling morphology of *Pachira insignis* (Swartz) Savigny has been documented (*de Bruijn 969*, MO). In this collection, one cotyledon is massive and fleshy like its counterpart of *P. aquatica*, but both cotyledons are raised above the ground (epigeal) in contrast to the hypogeal cotyledons of *P. aquatica* and, supposedly, of the whole genus.

Seed size within *Bombacopsis* sensu lato appears to co-vary with the quantity of silky or wooly, nonwettable hairs (kapok) produced by the endocarp of the fruit. Small-seeded species have copious amounts of kapok, which is dispersed together with the seeds. Presumably, this is an ecological adaptation to increase the magnitude of seed dispersal, perhaps by increasing buoyancy in wind or water. There also exist a number of large-seeded species of *Bombacopsis*, such as *B. subandina* (Dugand) A. Robyns and *B. speciosa* (Triana & Planchon) A. Robyns. In these species, the kapok has been reduced to a layer of short velutinous hairs on the inner surface of the endocarp; it does not surround the seeds. Given the large dimensions of their seeds and reduction of kapok, these species most likely have seedling morphologies like *Pachira aquatica* or *P. insignis*, contrary to Robyns's key. Phenetically, their overall similarity suggests that they are more closely related to *Pachira* than to other species of *Bombacopsis*. Cladistically, possession of large seeds and little kapok almost certainly represents a derived condition, a synapomorphy for these species and *Pachira*. Practically, flowering specimens of these large-fruited species of *Bombacopsis* cannot be distinguished from *Pachira* without reference to subtle characters of the pollen, or the ability to recognize individual species historically assigned to the two genera, suggesting that the unification of the genera would provide the nonspecialist with an entity that can be recognized much more easily.

In summary, because there are no strong arguments for retaining *Pachira* as a genus separate from *Bombacopsis* sensu lato, all species should be put into synonymy under *Pachira*, the older generic name.

(3) THE PROBLEM WITH PHYLOGENY

There are three potential reasons why generic transfers of all *Bombacopsis* species to *Pachira* should not be made here. First, there is a chance that additional field collections of *Pachira insignis* and the large-flowered, large-seeded species of *Bombacopsis* will demonstrate that the genera are fairly distinct by characters of their seedlings, but this seems unlikely. Second, transfers to *Pachira* sensu lato would include *Bombacopsis quinata* (Jacquin) Dugand, whose nomenclatural stability was deemed

important enough to cause the conservation of *Bombacopsis* over *Pochota* Ramírez Goyena (Proposal 883 in Brummitt, 1990). I find it difficult to believe that transfer of this species to *Pachira* will cause any significant problems in either the scientific or commercial literature, or that any serious attempt might be made to conserve *Bombacopsis* over this well-known, widely used generic name. Third, transfers should not be made if the new combinations are likely to be impermanent. It is difficult to predict the most conservative course from a nomenclatural point of view because the phylogeny of the Bombacaceae is unknown. It is possible that species of *Bombacopsis* or *Rhodognaphalopsis*, if placed into a unified genus, *Pachira* sensu lato, will have to be removed in a few years when a reliable phylogeny is available for the family. However, there is no assurance that the pollen and seedling characters now used to segregate genera will correspond to synapomorphies defining segregate genera in the future. At least as many new combinations may be necessary even if no transfers were made here.

One might argue that no action should be taken without full analysis of relationships to *Rhodognaphalon*, *Bombax*, *Pseudobombax*, and *Ericthaeca*, the other genera historically included in *Bombax* sensu lato. For instance, *Pseudobombax* differs from *Pachira* sensu lato primarily by the autapomorphy of inarticulate leaflets (unique in the Bombacaceae). Retaining *Pseudobombax* as a separate entity from *Pachira* sensu lato might make the latter paraphyletic (though many could accept such a genus), or even polyphyletic. Similarly, retaining the African genus *Rhodognaphalon* as a separate entity from *Pachira* sensu lato might also make the latter paraphyletic, but without a cladistic phylogeny of the group this cannot be known. The task at hand, however, is the production of a Flora treatment that includes recognizable genera. Phylogenetic information is desperately needed to produce an evolutionary classification of the family, but the lack of this information does not mitigate against the designation of a workable generic system here.

In conclusion, all 18 Venezuelan Guayanan species of *Bombacopsis*, *Pochota*, and *Rhodognaphalopsis* are here placed in synonymy with *Pachira*, giving a total of 24 species of *Pachira* sensu lato in the Flora area. Outside of the Venezuelan Guayana, there are approximately 25 additional species and varieties of *Bombacopsis* and *Rhodognaphalopsis*, of which 7 have legitimate names under *Pachira* (including the well-known Central American species *Pachira* [*Bombacopsis*] *sessilis* Bentham). The other 18 taxa are not transferred here, pending further study.

Pachira amazonica (A. Robyns) W. S. Alverson, comb. nov. Basionym: *Bombacopsis amazonica* A. Robyns, Bull. Jard. Bot. Etat. 33: 186. 1963. *Pochota amazonica* (A. Robyns) Steyermark & W. D. Stevens, Ann. Missouri Bot. Gard. 75: 397. 1988. TYPE: Venezuela. Amazonas: Sta. Cruz, Río Atabapo, near mouth of Río Atacavi, *Foldats 3794* (holotype, US; isotype, VEN not seen).

Pachira aracamuniana (Steyermark) W. S. Alverson, comb. nov. Basionym: *Pochota aracamuniana* Steyermark, Ann. Missouri Bot. Gard. 76: 951, fig. 4. 1989. TYPE: Venezuela. Amazonas: Dept. Río Negro, Cerro Aracamuni summit, 01°32′N, 65°49′W, 1,400 m, *Liesner & Carnevali 22559* (holotype, MO; isotype, VEN not seen).

Pachira coriacea (Martius) W. S. Alverson, comb. nov. Basionym: *Bombax coriaceum* Martius, Nov. Gen. Sp. Pl. 1: 93. 1826. *Rhodognaphalopsis coriacea* (Martius) A. Robyns, Bull. Jard. Bot. Etat 33: 289. 1963. *Pochota coriacea* (Martius) Steyermark & W. D. Stevens, Ann. Missouri Bot. Gard. 75: 397. 1988. TYPE: Colombia. Amazonas: *Martius s.n.* (holotype, M not seen).

This species represents two of the three subspecies of *Rhodognaphalopsis coriacea* designated by A. Robyns, subsp. *coriacea* and subsp. *orinocensis* A. Robyns, which are not distinct from each other. The third subspecies, subsp. *sordida* (R. E. Schultes) A. Robyns, occurs in Venezuela and is included below as *Pachira sordida* (R. E. Schultes) W. S. Alverson.

Pachira cowanii (A. Robyns) W. S. Alverson, comb. nov. Basionym: *Bombacopsis cowanii* A. Robyns, Mem. New York Bot. Gard. 17: 190. 1967. *Pochota cowanii* (A. Robyns) Steyermark & W. D. Stevens, Ann. Missouri Bot. Gard. 75: 397. 1988. TYPE: Venezuela. Amazonas: igneous knob along Caño Asisa, 3 km below Parú savanna camp, 200 m, *Cowan & Wurdack 31534* (holotype, MO; isotype, NY not seen).

Pachira faroensis (Ducke) W. S. Alverson, comb. nov. Basionyn: *Bombax faroense* Ducke, Arch. Jard. Bot. Rio de Janeiro 4: 122. 1925. *Rhodognaphalopsis faroensis* (Ducke) A. Robyns, Bull. Jard. Bot. Etat 33: 292. 1963. TYPE: Brazil. Pará: *Ducke s.n.* [MG 15791] (holotype, RB not seen; isotypes, K not seen, MG not seen, S not seen, U not seen).

Pachira fuscolepidota (Steyermark) W. S. Alverson, comb. nov. Basionym: *Pochota fuscolepidota* Steyermark, Ann. Missouri Bot. Gard. 75: 1077. 1988. TYPE: Venezuela. Amazonas: Dept. Atabapo, Cerro Marahuaca, 1–2 km N of Sima Camp, 03°43′N, 65°31′W, 1,100 m, *Liesner 18452* (holotype, MO; isotype, VEN not seen).

Pachira gracilis (A. Robyns) W. S. Alverson, comb. nov. Basionym: *Rhodognaphalopsis gracilis* A. Robyns, Mem. New York Bot. Gard. 17: 199. 1967. *Pochota gracilis* (A. Robyns) Steyermark & W. D. Stevens, Ann. Missouri Bot. Gard. 75: 397. 1988. TYPE: Venezuela. Amazonas: Río Pacimoni, 12 km below mouth of Río Yatua, 100–140 m, *Maguire, Wurdack & Maguire 41653* (holotype, MO; isotype, NY not seen).

Pachira gracilis subsp. **bolivarensis** (Steyermark) W. S. Alverson, comb. nov. Basionym: *Pochota gracilis* (A. Robyns) Steyermark & W. D. Stevens subsp. *bolivarensis* Steyermark, Ann. Missouri Bot. Gard. 75: 1078. 1988. TYPE: Venezuela. Bolívar: Río Kanarakuni, southern base of Cerro Sarisariñama, 400 m, *Steyermark 98206* (holotype, VEN not seen; isotype, NY).

Pachira liesneri (Steyermark) W. S. Alverson, comb. nov. Basionym: *Pochota liesneri* Steyermark, Ann. Missouri Bot. Gard. 75: 1079. 1988. TYPE: Venezuela. Amazonas: Dept. Atabapo, Salto Yureba, Cerro Yureba, lower Ventuari, ca. 04°03′N, 66°01′W, 350 m, *Liesner 18637* (holotype, MO; isotype, VEN not seen).

Pachira mawarinumae (Steyermark) W. S. Alverson, comb. nov. Basionym: *Pochota mawarinumae* Steyermark, Ann. Missouri Bot. Gard. 75: 1079. 1988. TYPE: Venezuela. Amazonas: Dept. Río Negro, near Cerro Neblina Base Camp on the Río Mawarinuma, 00°50′N, 66°10′W, 140 m, *Liesner 16355* (holotype, MO; isotype, VEN not seen).

Pachira obovata (A. Robyns) W. S. Alverson, comb. nov. Basionym: *Bombacopsis obovata* A. Robyns, Mem. New York Bot. Gard. 17: 192. 1967. *Pochota obovata* (A. Robyns) Steyermark & W. D. Stevens, Ann. Missouri Bot. Gard. 75: 397. 1988. TYPE: Venezuela. Amazonas: Ríos Pacimoni–Yatua, Casiquiare, rainforest along Río Yaciba, 2 hours above mouth, 160 m, *Maguire, Wurdack & Bunting 36529* (holotype, MO; isotype, NY not seen).

Pachira orinocensis (A. Robyns) W. S. Alverson, comb. nov. Basionym: *Bombacopsis orinocensis* A. Robyns, Mem. New York Bot. Gard. 17: 193. 1967. *Pochota orinocensis* (A. Robyns) Steyermark & W. D. Stevens, Ann. Missouri Bot. Gard. 75: 398. 1988. TYPE: Venezuela. Bolívar: occasional, Río Orinoco, 100–300 m, *Wurdack & Monachino 39836* (holotype, MO; isotype, NY not seen).

Pachira paraensis (Ducke) W. S. Alverson, comb. nov. Basionym: *Bombax paraense* Ducke, Arch. Jard. Bot. Rio de Janeiro 4: 124. 1925. *Bombacopsis paraensis* (Ducke) A. Robyns, Bull. Jard. Bot. Etat 33: 213. 1963. TYPE: Brazil. Pará: *Ducke s.n.* [RB 18094] (lectotype, RB; isolectotypes, G, K, S, US).

Pachira pseudofaroensis (A. Robyns) W. S. Alverson, comb. nov. Basionym: *Rhodognaphalopsis pseudofaroensis* A. Robyns, Mem. New York Bot. Gard. 17: 201. 1967. *Pochota pseudofaroensis* (A. Robyns) Steyermark & W. D. Stevens, Ann. Missouri Bot. Gard. 75: 398. 1988. TYPE: Venezuela. Amazonas: igneous knob along Caño Asisa, 3 km below Parú savanna camp, 200 m, *Cowan & Wurdack 31547* (holotype, MO; isotype, NY).

Pachira quinata (Jacquin) W. S. Alverson, comb. nov. Basionym: *Bombax quinatum* Jacquin, Enum. Syst. Pl. 26. 1760. *Pochota quinata* (Jacquin) W. D. Stevens, Taxon 36: 463. 1987. TYPE: Panama. Canal Zone: *Fendler 310* (neotype, K not seen; isoneotypes, BM not seen, FI not seen, GH not seen, MO not seen, TDC not seen, US).

Pachira robynsii (Steyermark & W. D. Stevens) W. S. Alverson, comb. nov. Basionym: *Pochota robynsii* Steyermark & W. D. Stevens, nom. nov., Ann. Missouri Bot. Gard. 75: 1586. 1988. Replaced name: *Bombacopsis coriacea* A. Robyns, Mem. New York Bot. Gard. 17: 190. 1967. TYPE: Venezuela. Amazonas: Cerro Neblina, Río Yatua, slopes E of Cumbre Camp, 1,600–1,800 m, *Maguire, Wurdack & Maguire 42182* (holotype, NY).

Pachira rupicola (A. Robyns) W. S. Alverson, comb. nov. Basionym: *Bombacopsis rupicola* A. Robyns, Bull. Jard. Bot. Etat 33: 188. 1963. TYPE: Venezuela. Bolívar: *L. Williams 11630* (holotype, US not seen; isotypes, F not seen, US not seen).

Pachira sordida (R. E. Schultes) W. S. Alverson, comb. nov. Basionym: *Bombax sordidum* R. E. Schultes, Bot. Mus. Leafl. 16: 75. 1953. *Rhodognaphalopsis coriacea* (Martius) A. Robyns var. *sordida* (R. E. Schultes) A. Robyns, Bull. Jard. Bot. Etat 33: 292. 1963. *Pochota sordida* (R. E. Schultes) Steyermark & W. D. Stevens, Ann. Missouri Bot. Gard. 75: 398. 1988. TYPE: Colombia. Vaupes: Río Negro, El Castillo or San Felipe, near confluence of Ríos Guainia and Casiquiare, *Schultes & Lopez 9342* (holotype, GH not seen).

Pachira tepuiensis (Steyermark) W. S. Alverson, comb. nov. Basionym: *Pochota tepuiensis* Steyermark, Ann. Missouri Bot. Gard. 75: 1081–1082. 1988. TYPE: Venezuela. Bolívar: Meseta de Jaua, Cerro Sarisariñama, summit, 04°41′40″N, 64°13′20″W, 1,380 m, *Steyermark, Carreño Espinosa & Brewer-Carias 108938* (holotype, VEN not seen; photo of holotype, MO).

Finally, in keeping with Steyermark's treatment of the genus *Pochota*, the following species is new for the Venezuelan Guayana:

Pachira yapacanae Steyermark ex W. S. Alverson, sp. nov. TYPE: Venezuela. Amazonas: Cerro Yapacana, savanna number three, 130 m, 1 Jan. 1951 (fr), *Maguire, Cowan, & Wurdack 30589* (holotype, NY).

Arbor ad 5 m; *foliolis* 4–5 late ovato-oblongis apice rotundatis basi rotundatis vel late obtusis 8–10.5 cm longis 4.5–6 cm latis conspicue discoloribus subtus indumento farinaceo pallido grisaceo obtectis.

Tree to 5 m tall. *Leaves* 4–5 foliolate. *Petioles* 6.5–7 cm long. *Leaflets* subcoriaceous, broadly ovate-oblong, rounded at apex, rounded or broadly obtuse at base, 8–10.5 cm long, 4.5–6 cm wide; lower surface completely covered by a pale gray farinaceous indument, conspicuously dark brown lepidote beneath; lateral secondary nerves 9–13 on each side, slightly elevated below, anastomosing 3–7 mm from the margin, slightly impressed above; intermediate nerves less prominent; tertiary venation slightly elevated below, loosely reticulate, subhorizontal to 10°-angled. *Petiolule* 5–8 mm long, 2 mm wide. *Pedicel* solitary, axillary, 1.5 cm long, 3 mm wide. *Receptacle* glandular, 0.7 cm long, 1 cm wide, pale lepidote. *Calyx* tube shortly campanulate, truncate at summit, 0.5 cm long, 1 cm wide at summit, pale lepidote. Capsule obovate, truncate at summit, 4 cm long, 2.5 cm wide at summit, glabrous except for the reddish brown lepidote surface.

This species is distinguished from other species of *Pachira* by the combination of a pale gray farinaceous indument on the lepidote lower leaf surface, and the broadly ovate-oblong leaf blades rounded at the apex and rounded or broadly obtuse at the base.

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Literature Cited

Alverson, W. S. 1989. *Matisia* and *Quararibea* (Bombacaceae) should be retained as separate genera. Taxon 38: 377–388.

Brummitt, R. K. 1990. Report of the Committee for Spermatophyta. 37. Taxon 39: 293–296.

Hutchinson, J. 1967. The Genera of Flowering Plants, Dicotyledones, vol. 2. Oxford Univ. Press, London.

Lynch, R. I. 1880. On the seed structure and germination of *Pachira aquatica*. J. Linn. Soc., Bot. 17: 147–149.

Nilsson, S. & A. Robyns. 1986. Bombacaceae Kunth. *In:* S. Nilsson (editor), World Pollen and Spore Flora 14: 1–59.

Paula, J. E. de. 1969. Estudos sôbre Bombacaceae—I. Ciência e Cultura 21(4): 697–719.

Piccolo, Antonia Lelia Guadagnuci. 1981. Sôbre o fruto, semente e estágios iniciais de desenvolvimento de *Bombacopsis glabra* (Pasq.) A. Robyns. Garcia de Orta, Bot. 5(1): 1–4, plus three unpaginated plates.

Robyns, A. 1963. Essai de monographie du genre *Bombax* s.l. (Bombacaceae). Bull. Jard. Bot. Etat 33(1/2): 1–316.

———. 1967. Bombacaceae. Pp. 190–201 *in* B. Maguire et al., The Botany of the Guyana Highland, part 7. Mem. New York Bot. Gard. 17: 190–201.

Sandwith, N. Y. 1931. Contributions to the flora of tropical America—IV, The Baromallis of British Guiana. Kew Bull. 1931: 46–54.

Shepherd, J. D. & W. S. Alverson. 1981. A new *Catostemma* (Bombacaceae) from Colombia. Brittonia 33: 587–590.

Steyermark, J. A. 1987. Flora of the Venezuelan Guayana—III. Ann. Missouri Bot. Gard. 74: 609–658.

——— & W. D. Stevens. 1988. Notes on *Rhodognaphalopsis* and *Bombacopsis* (Bombacaceae) in the Guayanas. Ann. Missouri Bot. Gard. 75: 396–398.

New Species of *Daphnopsis* (Thymelaeaceae) from Panama

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ABSTRACT. *Daphnopsis folsomii*, *D. hammelii*, and *D. morii* are described and illustrated. A key to the Panamanian species of Thymelaeaceae is provided.

For many years only one species of *Daphnopsis* C. Martius & Zuccarini, *D. americana* (Miller) Johnston, was known in Panama (Nevling, 1959; Woodson, 1958). A second species, *D. correae* Barringer & Nevling, was added recently (Nevling & Barringer, 1986). The three species described here increase the number of species known from Panama to five. One species of *Schoenobiblus* C. Martius & Zuccarini, *S. panamensis* Standley & L. O. Williams, is known from Panama. *Daphnopsis americana* and *S. panamensis* are lowland species and are relatively widespread. The rest of the species are found in upland regions, and their distributions appear to be discrete (Fig. 4).

KEY TO THE SPECIES OF THYMELAEACEAE IN PANAMA

1a. Calyx lobes longer than the tube; stamens exserted, filaments > 1 mm long .... *Schoenobiblus panamensis*
1b. Calyx lobes shorter than the tube; stamens included or borne at the mouth, filaments < 1 mm long, (*Daphnopsis*).
2a. Inflorescence a dichotomously branched umbel; antisepalous stamens borne on calyx lobes ..... *D. americana* subsp. *caribaea*
2b. Inflorescence capitate or racemose; antisepalous stamens borne at or just below the mouth of the hypanthium.
3a. Calyx bicolored; disc lobulate ..... *D. correae*
3b. Calyx unicolored; disc annular.
4a. Tree; staminate inflorescence racemose, primary peduncles 2–2.5 cm long; leaves 4–13 cm long ..... *D. hammelii*
4b. Shrub; staminate inflorescence a capitulum, primary peduncles 0.1–0.8 cm long; leaves 13–21 cm long.
5a. Pedicels 2–5 mm long; leaves often glaucous ..... *D. morii*
5b. Pedicels to 1 mm long; leaves green below ..... *D. folsomii*

Daphnopsis folsomii Barringer & Nevling, sp. nov. TYPE: Panama. Darién: Cerro Pirre, 10–20 July 1977, *Folsom 4543* (holotype, MO). Figure 1.

Species *D. hammellii* foliis glabris inflorescentiis bracteatis flores subsessilis stylis 4 mm longis differt.

Subshrub, 0.5–2 m tall; bark brown; stems dichotomously branched, glabrous. Leaves alternate; petioles 0.7–1.5 cm long, slightly thickened, glabrous; blade oblanceolate to obovate, 12–25 cm long, 4.5–11.5 cm wide, subcoriaceous to coriaceous, glabrous, green above, lighter below, the base cuneate, the apex acuminate, the venation obscure above, prominent below. Staminate inflorescence not seen. Pistillate inflorescence terminal, capitate, sericeous, the rachis 2–4 mm long, the secondary peduncle 1 mm long, many-flowered, the bracts lanceolate, 5–7 mm long, sericeous above, keeled, acuminate. Pistillate flowers 10–15 per inflorescence; pedicel less than 1 mm long; hypanthium tubular, 5 mm long, 1–2 mm wide, sericeous; calyx lobes triangulate, 2 mm long, 1 mm wide at the base, recurved, glabrous within, with a tuft of trichomes at the apex; staminodes 4, minute; disc annular, less than 1 mm tall; pistil 4–6 mm long, borne on a gynophore 0.5 mm long, the style 4 mm long, exserted, the stigma capitate. Fruit white, ovoid, 15–20 mm long, 6–12 mm wide, the apex rounded.

This species is named for James Folsom of the Huntington Botanical Gardens. It is known from Cerro Pirre in the eastern Darién Province and from the vicinity of Alto Calvario, north of El Copé in the Coclé Province (Fig. 4). We know of no explanation for this apparent disjunction.

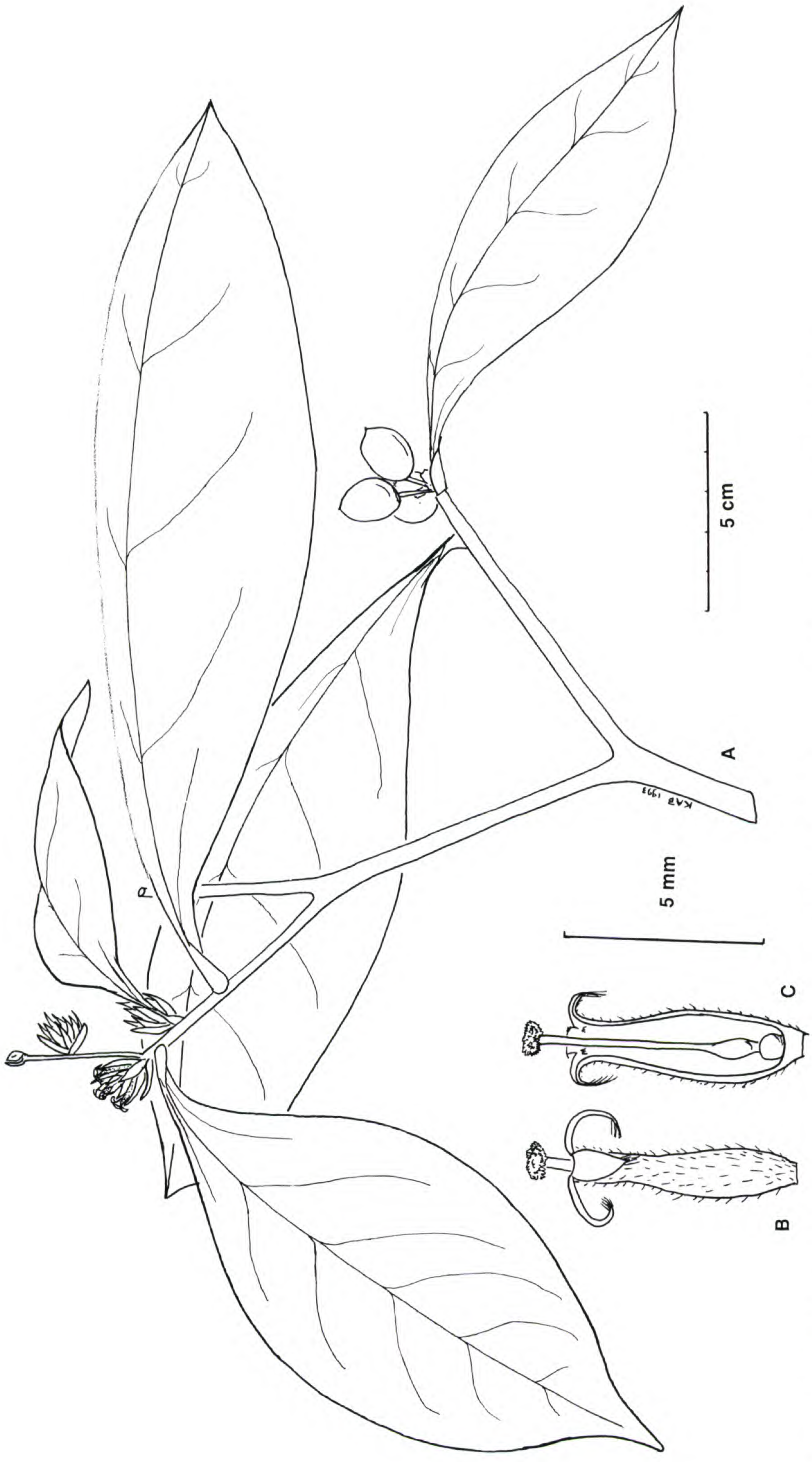

Figure 1. *Daphnopsis folsomii* Barringer & Nevling. —A. Habit. —B. Female flower. —C. Longitudinal section of female flower.

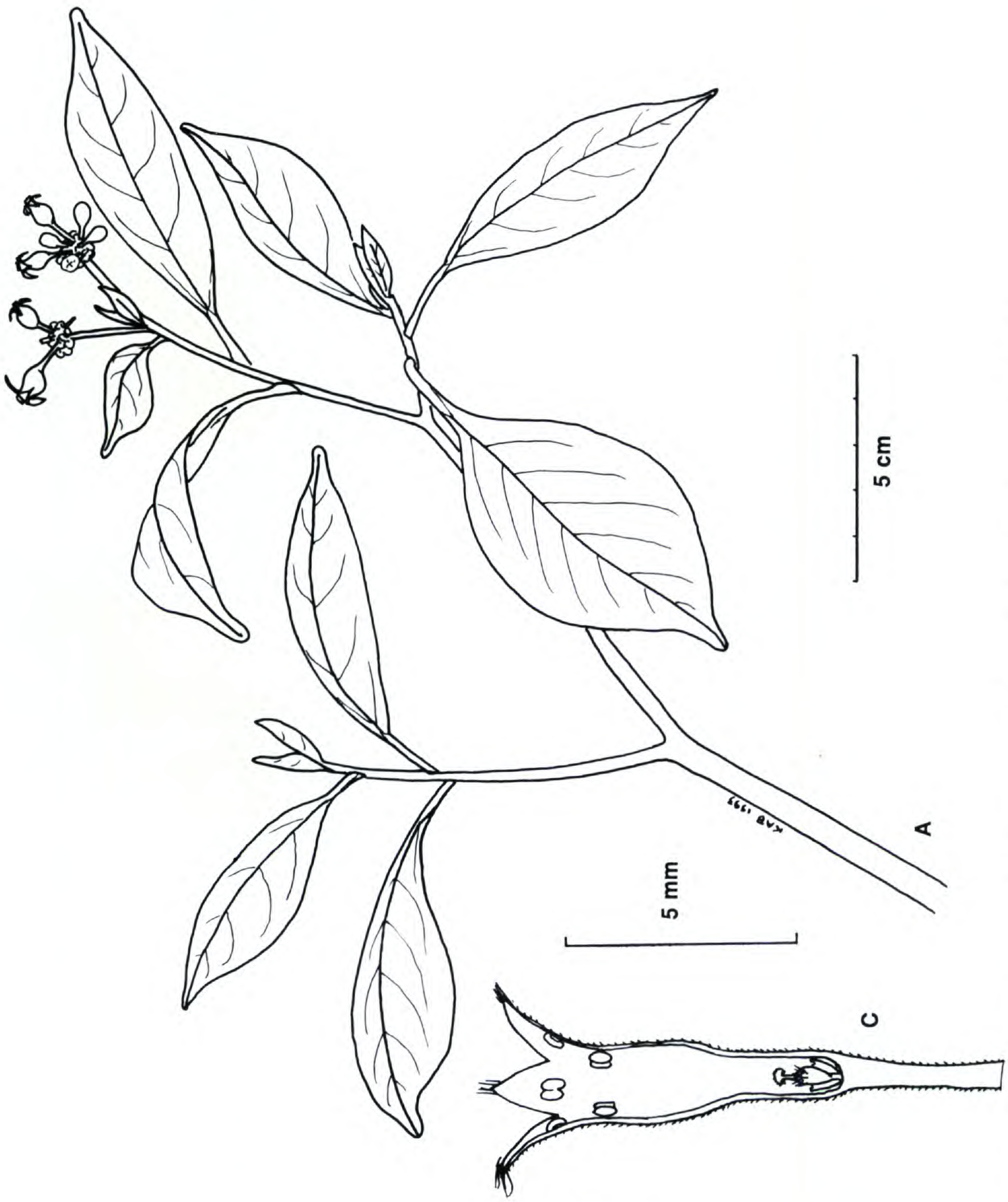

Figure 2. *Daphnopsis hammelii* Barringer & Nevling. —A. Habit. —B. Female flower. —C. Male flower.

The species differs from all other *Daphnopsis* by the densely bracteolate pistillate inflorescence. It is classified in subgenus *Daphnopsis* because of its dichotomous branching and extra-axillary inflorescences. It is similar to *D. hammellii* Barringer & Nevling, but differs from that species in having larger leaves and subsessile flowers.

Paratypes. PANAMA. **Darién:** Cerro Pirre, 10–20 July 1977, *Folsom 4543* (MO). **Coclé:** lumber camp at Alto Calvario, 7 km N of El Copé, 900 m, *Folsom 1285* (MO); Alto Calvario, forest around Rivera sawmill, 7+ km N of El Copé, 700–900 m, 13 Dec. 1980, *Folsom 3276* (MO); area surrounding Rivera sawmill, Alto Calvario, 7 km N of El Copé, 700–850 m, 25 Nov. 1977, *Folsom & Collins 6515* (MO); N of El Copé near continental divide, 8°38′N, 80°35′W, 750 m, 8 Apr. 1988, *McPherson 12427* (MO); between Caña Susio and waterfall at base of Cerro Tife, NW of El Copé and El Petroso sawmill, 8°38′N, 80°36′W, 13 Dec. 1980, *Sytsma, Hahn & Antonio 2531* (MO).

Daphnopsis hammelii Barringer & Nevling, sp. nov. TYPE: Panama. Chiriquí: end of road past Palo Alto, NE of Boquete, in forest along ridge, 6,600 ft., 8 Feb. 1979, *Hammel 6065* (holotype, MO). Figure 2.

Species *D. anomalae* inflorescentiis capitatis, hypanthiis masculinis anguste tubulosis hypanthiis femininis urceolatis diversa.

Tree or shrub, to 5 m tall; trunk to 30 cm DBH, bark reddish brown, becoming gray; stems dichotomously branched, sericeous, glabrescent. Leaves alternate; petioles 8–10 mm long, flattened above, sericeous to glabrescent; blade oblanceolate to lanceolate, 4–13 cm long, 2.2–4 cm wide, coriaceous to subcoriaceous, glabrous and dark green above, sericeous, glabrescent, and light green below, the base cuneate, the apex acute to acuminate, the venation obscure above, prominent below, with a marginal vein developed toward the apex. Staminate inflorescence racemose to capitate, sericeous; primary peduncle 2–2.5 cm long; rachis 1.7 mm long; secondary peduncle 1 mm long. Staminate flowers 35–50 per head; pedicel 4–5 mm long, sericeous; hypanthium narrowly tubular, greenish white, 8–10 mm long, flaring and 2 mm wide at the mouth, sericeous outside, glabrous within; calyx lobes triangular, 2 mm long, reflexed, glabrous within; petals absent; stamens 8, obdiplostemonous, the antisepalous whorl borne at the mouth of the hypanthium, exserted, the alternisepalous whorl borne 2 mm below the mouth of the hypanthium, included, the anthers ovoid, sessile, about 1 mm long; disc annular; pistillode bottle-shaped, 1 mm long, sericeous. Pistillate inflorescence terminal, capitate, sericeous; rachis 1–3 mm long; secondary pedicel 1 mm long. Pistillate flowers 2–3 per inflorescence; pedicel 2–4 mm long; hypanthium urceolate, narrowed at the mouth, 2–3 mm long, 1–2 mm wide, sericeous; calyx lobes triangulate, 1–2 mm long, strongly recurved, glabrous within, with a tuft of trichomes at the apex; staminodes 4, minute; disc annular, less than 1 mm tall; pistil 1.0–1.5 mm long, borne on a gynophore less than 0.5 mm tall, the style 1 mm long, slightly exserted, the stigma capitate. Drupe green, ovoid, to 15 mm long, 8 mm wide, the apex obtuse.

This species is named for Barry Hammel of the Missouri Botanical Garden. It is only known from around Boquete in western Panama (Fig. 4). It is distinctive among the Panamanian species because of its capitate inflorescences, large, narrowly tubular, male flowers, and urceolate female flowers with a constriction at the mouth. It is classified in subgenus *Daphnopsis* and appears to be most closely related to the Colombian species *D. anomala* (Kunth) Nevling. *Daphnopsis hammelii* can be easily distinguished from that species by having capitate inflorescences and narrowly tubular hypanthia. It is similar to *D. folsomii* Barringer & Nevling, but that species differs in having larger leaves, subsessile flowers, and densely bracteate pistillate inflorescences.

Paratypes. PANAMA. **Bocas del Toro:** NW of Cerro Pate Macho, 6,400 ft., 10 Feb. 1979, *Hammel 6104* (MO). **Chiriquí:** between Palo Alto and top of divide near Cerro Pate Macho, above Río Palo Alto, NE of Boquete, 5,400–7,100 ft., 18 Mar. 1979, *D'Arcy, Hammel & Averett 12653* (MO); end of road past Palo Alto, NE of Boquete, in forest along ridge, 6,200–6,800 ft., 8 Feb. 1979, *Hammel 6041* (MO); 3.5 mi. NE of Boquete, end of road along Río Palo Alto, 6,400 ft., 18 Nov. 1978, *Hammel 5696* (MO); end of road past Palo Alto NE of Boquete, 6,600 ft., 8 Feb. 1979, *Hammel 6065* (MO).

Daphnopsis morii Barringer & Nevling, sp. nov. TYPE: Panama. Chiriquí: N of San Félix, at the Chiriquí–Bocas del Toro border, on Cerro Colorado, copper mine road along the continental divide, 5,000–5,500 ft., 4 May 1975, *Mori & Kallunki 5889* (holotype, F; isotype, MO). Figure 3.

Species *Daphnopsis tuerckheimianae* affinis sed foliis longioribus 13–21 cm longis, pedunculo 5–8 mm longo, inflorescentiis sericeo, disco annulari.

Shrub to 1.5 m tall; young growth sericeous, glabrescent; older growth with a light brown cortex, the lenticels not prominent. Leaves alternate; petiole 7–10 mm long, slightly winged, glabrous; blade lanceolate to oblanceolate, 13–21 cm long, 4–6.5 cm

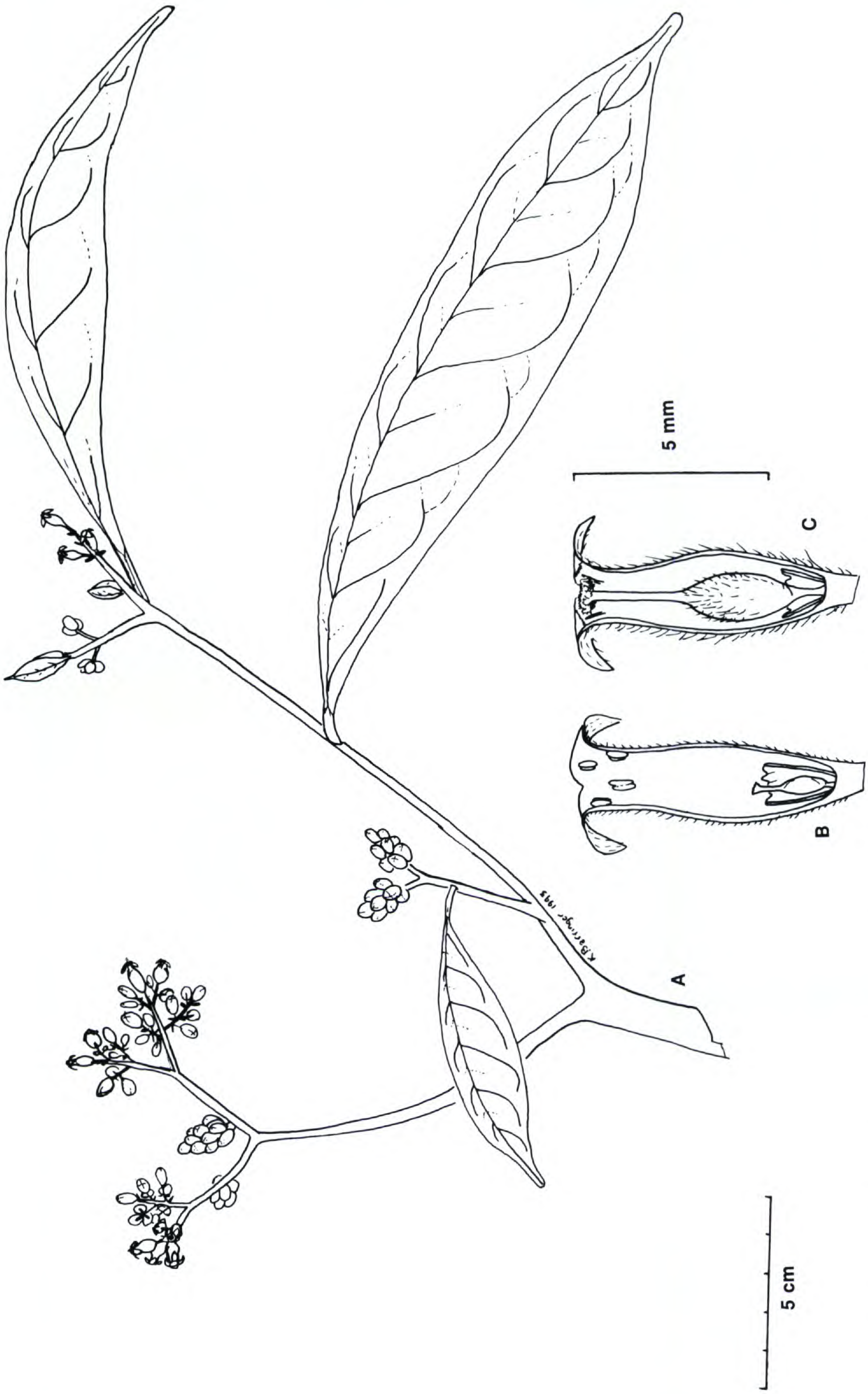

Figure 3. *Daphnopsis morii* Barringer & Nevling. —A. Habit. —B. Male flower. —C. Female flower.

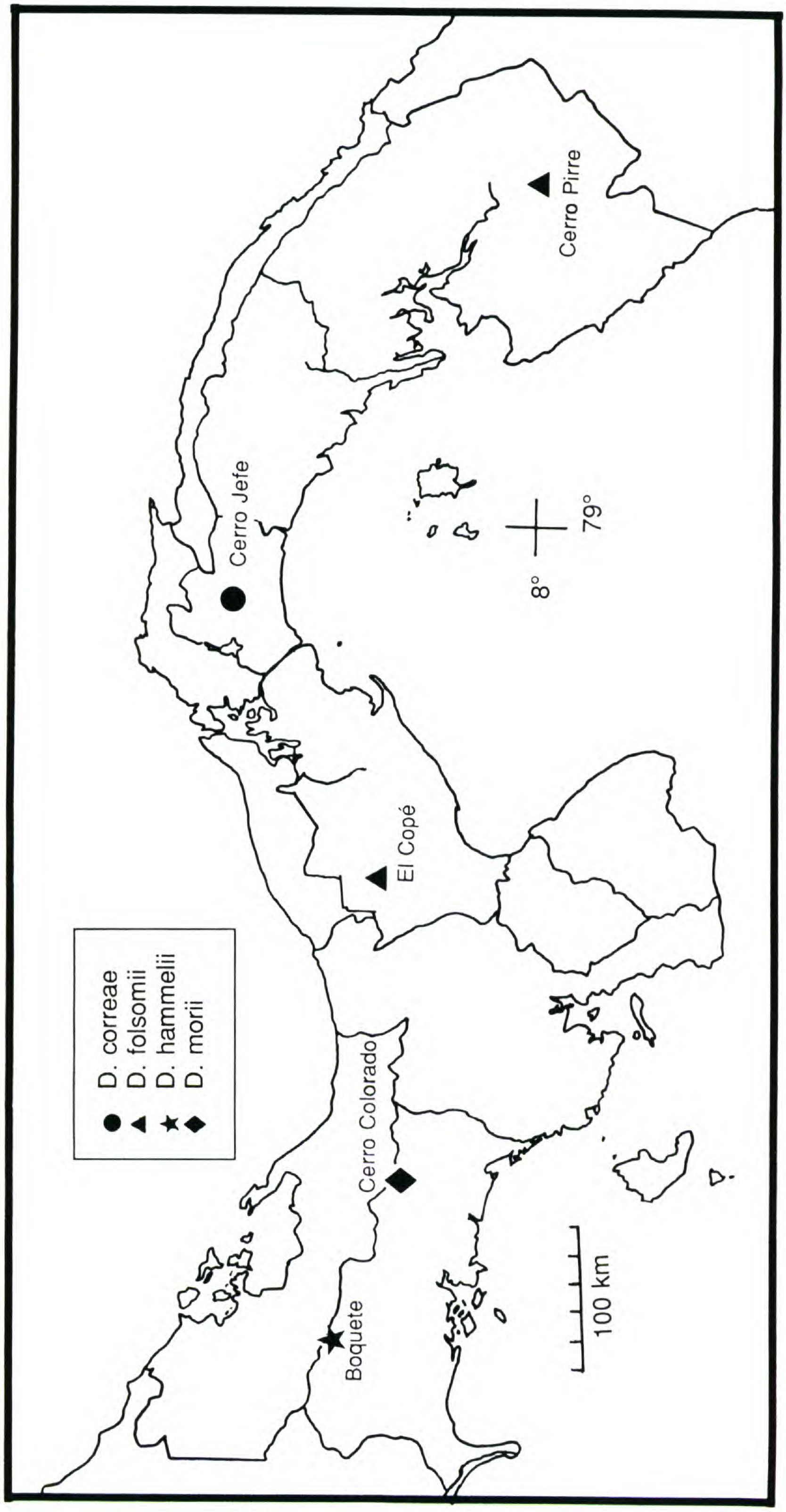

Figure 4. Distributions of *Daphnopsis correae*, *D. folsomii*, *D. hammelii*, and *D. morii*.

wide, subcoriaceous, glabrous and green above, light green and slightly pubescent on the veins below, the base cuneate, the margin slightly revolute when dry, the apex acuminate, the venation obscure above, prominent below, with a well-developed marginal vein. Staminate inflorescence capitate, sericeous; primary peduncle 0.5–0.8 mm long; rachis 1 mm long; secondary peduncle 1–2 mm long. Staminate flowers 6–12 per inflorescence; pedicel absent; hypanthium tubular, white, 5 mm long, 1.5–2 mm wide at the mouth, densely sericeous outside, glabrous within; calyx lobes 2 mm long, glabrous within; petals absent; stamens yellow, 8, obdiplostemonous, included, the antisepalous whorl inserted at the mouth of the hypanthium, the alternisepalous whorl inserted about 1.5 mm below the mouth of the corolla, the anthers ovoid, sessile, about 1 mm long, bright orange; disc annular, adnate to the gynophore; pistillode bottle-shaped, 1 mm long, glabrous, the gynophore 0.1–0.2 mm long. Pistillate inflorescences terminal, capitate to racemose, densely sericeous, the rachis 4–15 mm long, the bracts lanceolate, 4–8 mm long, sericeous. Pistillate flowers 6–12 per inflorescence; pedicel to 1 mm long; calyx tube tubular to urceolate, 5–6 mm long, 2 mm wide, sericeous; calyx lobes narrowly triangulate, 2 mm long, 1 mm wide at the base, recurved, glabrous within except for a ring of very short trichomes at the mouth; staminodes 4, less than 1 mm long; disc annular, lobulate, 0.5 mm tall; pistil 1.5–2 mm long, sericeous, borne on a gynophore 0.5 mm long, the style 3 mm long, slightly exserted, the stigma capitate. Drupes ovoid, white, 10–12 mm long, 8–9 mm wide, the apex acute.

This species is named for Scott Mori, of the New York Botanical Garden. It is known only from Cerro Colorado in western Panama (Fig. 4). It is classified in subgenus *Daphnopsis* and appears to be most closely related to *D. tuerckheimiana* but differs by having primary peduncles 5–8 mm long, an annular disc, a sericeous inflorescence, and leaves 13–21 cm long. *Daphnopsis americana* (Miller) Johnston subsp. *caribaea* (Grisebach) Nevling, the most common species in Panama, is easily distinguished by its branched inflorescences, anthers borne at the mouth of the hypanthium, and the presence of an annulus at the mouth of the hypanthium.

Paratypes. PANAMA. **Chiriquí:** Cerro Colorado, intersection of Bocas road with main road, 11.8 km from Chami, 1,400–1,700 m, 24 Oct. 1977, *Folsom 6107* (MO); Cerro Colorado, Bocas Road, 1,500 m, 17–18 Feb. 1977, *Folsom & Collins 1779* (MO); Cerro Colorado, road to Bocas del Toro, just above face of mine, 1,600–1,700 m, 14 Aug. 1977, *Folsom, Small & Robbins 4747* (MO); ½ km N of Quebrada de Arena, Carretera de Oleoducta IRHE Fortuna Hydroelectric Project, 8°46′N, 82°12′W, 1,100 m, 12 Mar. 1982, *Knapp, Kress & Hammel 4029* (MO); Cerro Colorado, on road 35.6 km from Río San Felix bridge, 1,390 m, 15 July 1976, *Sullivan 404* (MO).

Literature Cited

Nevling, L. I. 1959. A revision of *Daphnopsis*. Ann. Missouri Bot. Gard. 46: 257–358.

——— & K. Barringer. 1986. New and noteworthy species of *Daphnopsis* (Thymelaeaceae) from Mexico and Central America. Phytologia 61: 361–366.

Woodson, R. E. 1958. Thymelaeaceae. *In:* R. Woodson et al. (editors), Flora of Panama. Ann. Missouri Bot. Gard. 45: 93–97.

New Combinations in *Pleuropogon* (Poaceae)

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ABSTRACT. *Pleuropogon* Robert Brown subg. *Lophochlaenus* (C. G. Nees von Esenbeck) But is proposed to accommodate all species in the genus other than *P. sabinii*. *Pleuropogon davyi* Benson is reduced to *P. californicus* var. *davyi* (Benson) But.

Two nomenclatural changes are proposed here to prepare the way for a treatment of *Pleuropogon* Robert Brown for the forthcoming *Manual of North American Grasses*.

Pleuropogon Robert Brown has been generally regarded as a small genus of 4–6 species (Benson, 1941; Howell, 1946; Chase in Hitchcock, 1951; Clayton & Renvoize, 1986). These species are hydrophilous grasses found growing in vernal pools, marshy grasslands, meadows, and other wet places. They are easily distinguishable from other grasses by the following combination of characters: culms and leaves soft; sheaths closed; raceme terminal; spikelets linear, with 5–20(–30) florets, oriented toward one direction giving the raceme the appearance of a semaphore; lemmas awnless or awned, with 7(–9) veins, the veins not convergent at the scarious apex; paleal keels winged and bearing 1 or 2 awns or a triangular appendage; lodicules 2, completely fused to form a single block.

The type species of *Pleuropogon*, *P. sabinii* Robert Brown, has an arctic-circumboreal distribution from Alaska to arctic Canada, Greenland, Spitsbergen, Franz Josef Land, Novaya Zemlya, Taymyr, eastern Siberia, and also in alpine regions of the Altai mountains. It has small chromosomes and a somatic chromosome number of 40 (Holmer, 1952; Jorgensen et al., 1958; Löve & Ritchie, 1966; Hedberg, 1967; Zhukova, 1969; Löve & Löve, 1978), 41 (Löve & Löve, 1978), or 42 (Bowden, 1960; Mosquin & Hayley, 1966). The other species in the genus, however, are restricted to the Pacific Coast of North America, from southern British Columbia to central California; they have larger chromosomes and somatic chromosome numbers ranging from 16 to 18 and 36 (Myers, 1947; Löve & Löve, 1978). It was mainly because of their differences in distribution pattern, chromosome size, and basic chromosome numbers that Stebbins (in Jorgensen et al., 1958), Tateoka (1965), Tzvelev (1976, 1989), Löve & Löve (1978, 1980), and But (1986) either made or adopted the suggestion that the western cordilleran species should be transferred to *Lophochlaena* C. G. Nees von Esenbeck. This separation of the species into two major groups is further supported by the absence in *P. sabinii* of dwarf short-cells in the glume epidermis and of square, round-prickled cells in palea epidermis (But, 1977). However, a review of all morphological characters in the two groups of grasses showed that it would be more appropriate to retain the five species and one variety recognized here in two subgenera within *Pleuropogon*.

Pleuropogon Robert Brown subg. **Pleuropogon** Chlor. Melv. 226. 1823. TYPE: *Pleuropogon sabinii* Robert Brown.

This subgenus contains only the type species, *P. sabinii*.

Pleuropogon sabinii Robert Brown, Chlor. Melv. 226. 1823. *Pleuropogon sabinii* var. α Robert Brown, Chlor. Melv. 227. 1823. *Pleuropogon sabinii* var. *elatior* Hooker, Fl. Bor. Amer. 2: 249. 1840. TYPE: Canada. Melville Island: Northwest Territories, *Parry* (lectotype, selected here, BM, plant in lower right-hand corner).

Pleuropogon sabinii var. β Robert Brown, Chlor. Melv. 227. 1823. *Pleuropogon sabinii* var. *humilior* Hooker, Fl. Bor. Amer. 2: 249. 1840. TYPE: Canada. Melville Island: Northwest Territories, *Parry* (lectotype, selected here, BM, plant in upper left-hand corner).

Pleuropogon sabinii f. *aquaticus* Simmons, Rep. 2d Norwegian Arct. Exp. Fram. no. 2, 170. 1906. TYPE: Canada. Ellesmere Island: Fram Fjord, "in lacubus, rivulis etc.," 26 Aug. 1899, *Simmons 1600* (holotype, O; isotypes, C, CAN, K, LE, NY, S).

Pleuropogon sabinii f. *terrestris* Simmons, Rep. 2d Norwegian Arct. Exp. Fram. no. 2, 170. 1906. TYPE: Canada. Ellesmere Island: Fram Fjord, "in rivulis siccatis," 26 Aug. 1899, *Simmons 1666* (holotype, O; isotypes, BM, C, GH, NY, S).

Pleuropogon Robert Brown subg. **Lophochlaenus** (C. G. Nees von Esenbeck) But, comb. et stat. nov. *Lophochlaena* C. G. Nees von Esenbeck, Ann. Nat. Hist. ser. 1, 1: 283. 1838. TYPE: *Pleuropogon californicus* (C. G. Nees von Esenbeck) Bentham ex Vasey = *Lophochlaena californica* C. G. Nees von Esenbeck.

Four species are recognized in this subgenus: *P. californicus* (C. G. Nees von Esenbeck) Bentham ex Vasey, *P. oregonus* Chase, *P. hooverianus* (Benson) J. T. Howell, and *P. refractus* (A. Gray) Bentham ex Vasey. *Pleuropogon californicus* is further divided into the following two varieties:

Pleuropogon californicus (C. G. Nees von Esenbeck) Bentham ex Vasey var. **californicus,** Grasses U.S. 40. 1883. TYPE: U.S.A. California: 1833, *Douglas s.n.* (neotype, selected here, GH; isoneotypes, BM, K, NY).

Pleuropogon douglasii Trinius ex Steudel, Nom. Bot. ed. 2, 2: 355. 1841. nom. nud.; *Lepitoma brevifolia* Torrey ex Steudel, Nom. Bot. ed. 2, 2: 355. 1841. pro. syn.

Pleuropogon californicus (C. G. Nees von Esenbeck) Bentham ex Vasey var. **davyi** (Benson) But, comb. nov. Basionym: *Pleuropogon davyi* Benson, Amer. J. Bot. 28: 360. 1941. *Lophochlaena californica* var. *davyi* (Benson) A. Löve & D. Löve, Taxon 27: 375. 1978. TYPE: U.S.A. California: Lake County, 1 mi. N of Kelseyville, 14 June 1932, *Benson 3666* (holotype, POM; isotypes, DS, US, POM).

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Literature Cited

Benson, L. 1941. Taxonomic studies. Amer. J. Bot. 28: 358–360.

Bowden, W. M. 1960. Chromosome numbers and taxonomic notes of northern grasses. II. Tribe Festuceae. Canad. J. Bot. 38: 117–131.

But, P. P. H. 1977. Systematics of *Pleuropogon* R. Br. (Poaceae). Doctoral Dissertation, University of California, Berkeley. University Microfilms International, Ann Arbor.

———. 1986. Taxonomy of Oregon Semaphore Grass, *Lophochlaena oregona* (Poaceae). Madroño 33: 146–147.

Clayton, W. D. & S. A. Renvoize. 1986. Genera Graminum. Her Majesty's Stationery Office, London.

Hedberg, O. 1967. Chromosome numbers of vascular plants from arctic and subarctic North America. Ark. Bot. ser. 2, 6: 309–326.

Hitchcock, A. S. 1951. Manual of the Grasses of the United States (Revised by A. Chase). U.S. Dept. Agr. Misc. Publ. 200.

Holmer, K. 1952. Cytological studies on the flora of Peary Island, North Greenland. Meddel. Grønland. 128: 1–40.

Howell, J. T. 1946. Notes of the grass family in Marin County, California. Leafl. W. Bot. 4: 243–247.

Jorgensen, C. A., Th. Sorensen & M. Westergaard. 1958. The flowering plants of Greenland. Biol. Skr. 9(4): 1–172.

Löve, A. & D. Löve. 1978. Poaceae. *In:* A. Löve (editor), IOPB chromosome number reports LXI. Taxon 27: 375–392.

——— & ———. 1980. Resurrection of the grass genus *Lophochlaena*. Bol. Soc. Brot. ser. 2, 53: 563–585.

——— & J. C. Ritchie. 1966. Chromosome numbers from central northern Canada. Canad. J. Bot. 44: 429–439.

Mosquin, T. & D. E. Hayley. 1966. Chromosome numbers and taxonomy of some Canadian arctic plants. Canad. J. Bot. 44: 1209–1218.

Myers, W. M. 1947. Cytology and genetics of forage grasses. Bot. Rev. (Lancaster) 13: 318–421.

Tateoka, T. 1965. Notes on some grasses XVIII. Affinities of the genus Streblochaete. Bot. Mag. Tokyo 78: 289–293.

Tzvelev, N. N. 1976. Zlaki SSSR. Nauka Publishers, Leningrad, 2: 545–546. [Grasses of the Soviet Union (English Translation). Amerind Publishing Co., New Delhi, 2: 808 (1983).]

———. 1989. The system of grasses (Poaceae) and their evolution. Bot. Rev. (N.Y.) 55: 141–204.

Zhukova, P. G. 1969. Chromosome numbers in certain plant species indigenous to the northeast of the U.S.S.R. IV. Bot. Zhurn. 54: 1985–1990.

Paspalum biaristatum (Poaceae: Paniceae), a New Serpentine Endemic from Goiás, Brazil, and the Second Awned Species in the Genus

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ABSTRACT. *Paspalum biaristatum*, a perennial species of subgenus *Ceresia*, is described, illustrated, and compared to its putative sister species, the annual *P. longiaristatum* Davidse & Filgueiras, as well as to other species in the subgenus. A new section, *Biaristata*, is described to accommodate the new species and *P. longiaristatum*.

During a field trip to Niquelândia in the Brazilian state of Goiás to re-collect material of the recently described *Paspalum longiaristatum* (Davidse & Filgueiras, 1993), much to our surprise, another unusual *Paspalum* L. with awned spikelets was discovered. It seems obviously related to *P. longiaristatum* but differs in a number of significant characters and is here described as a new species.

Paspalum biaristatum Filgueiras & Davidse, sp. nov. TYPE: Brazil. Goiás: Niquelândia, Macedo, ca. 14°18′S, 48°23′W, 18 km N de Niquelândia, cerca de 80 cm de altura, raque cor verde, 10 jun. 1992, *T. S. Filgueiras 2341* (holotype, IBGE; isotypes, B, F, FLAS, ICN, ISC, K, MEXU, MO, P, R, RB, SI, SP, UB, US). Figure 1.

Paspalo longiaristato Davidse & Filgueiras spiculis anguste elliptico-lanceolatis, gluma superiore aristata, lemmate inferiori aristato, lodiculis nullis simile sed habitu perenni, culmis 73–125 cm altis, spiculis 3.8–4.5 mm longis, arista superioris glumae 4–7.1 mm longa et arista inferioris lemmatis 3.8–4.5 longa absimile.

Coarse, caespitose perennial. Rhizomes small, knotty, superficial. Culms 73–125 cm tall, semidecumbent at the base, erect upward, unbranched or branched, with 6–9 elongated internodes; internodes hollow, stramineous, the lower ones scaberulous toward the apex, the upper ones smooth, glabrous; nodes dark, the lower ones glabrous to papillose-hirsute, the upper ones glabrous. Leaves mostly cauline; sheaths strongly striate, rounded on the back, the lower ones papillose-hirsute, becoming glabrescent to glabrous upward, the margins free, one densely ciliate, the hairs 1–1.5 mm long, rarely both margins ciliate; ligule a minute ciliate membrane, the membrane 0.2–0.3 mm long, the cilia 1–1.2 mm long; blades 7.2–19.3 cm long, 1.2–5 mm wide, flat, linear, papillose-hirsute, the marginal hairs 1–2 mm long, slightly narrowed basally, abruptly acuminate apically, the midrib projected abaxially. Inflorescence of (1–)2–4(–7), racemosely arranged, unilateral racemes; peduncle included to well exserted, glabrous; common rachis 4–5.8 cm long, glabrous to papillose, with a tuft of hairs at the base of each internode and each raceme; racemes (1.7–)3–8(–13) cm long, arcuate, acuminate apically; raceme rachis extending beyond the spikelets to an acuminate sterile apex, prominently winged, the wings 4.5–7 mm wide, completely enclosing the spikelets, the central portion coriaceous, light green, the middle portion membranous, green or with purple spots, slightly striate, the outer portion hyaline, colorless, nerveless, the margins minutely denticulate-ciliolate. Spikelets solitary, alternately arranged on each side of the rachis, pedicelled; pedicel 0.3–0.5 mm long, scabrid. Spikelets 3.8–4.5 mm long, 0.4–0.5 mm wide, dorsally compressed, abaxial, disarticulating below the glumes and falling as a unit, narrowly elliptic-lanceolate in outline, pale, rarely purple, awned, with 2 florets; lower glume absent; upper glume 3.8–4.5 mm long, as long as the spikelet, awned, strongly 3-nerved, pale, rarely purplish, hyaline, narrowed at the base, slightly to prominently convex on the back in the lower ¼–⅓, flat in the upper ½, densely pubescent on the back in the lower ¼–⅓, otherwise glabrous, the margins densely pectinate-ciliate with hairs 1.7–2.2 mm long, the awn 4–7.1 mm long, minutely antrorsely scaberulous, flexuous, not geniculate; lower floret sterile, consisting only of an awned, lower lemma 3.8–4.5 mm long, pale, rarely purplish, hyaline, densely pubescent on the back in the lower ¼–⅓, otherwise glabrous on the back, the margins densely pectinate-ciliate with cilia 1.7–2.2 mm long, the awn 3.8–4.5 mm long, minutely antrorsely scaberulous, flex-

Figure 1. *Paspalum biaristatum* Filgueiras & Davidse. —A. Habit. —B. Ligular area of the leaf. —C. Portion of the winged rachis with the spikelets removed, showing the minute pedicel bases. —D. Spikelet at the beginning of anthesis. —E. Upper glume. —F. Lower lemma. —G. Upper floret, lemma side. —H. Upper floret, palea side. (Based on *Filgueiras 2341.*)

TABLE 1. Leaf blade size (length (cm) × width (mm)), inflorescence length (cm), and uppermost raceme length (cm), with their ratios, of 60 culms of *Paspalum biaristatum*.

	Leaf blade	Leaf L/W	Inflorescence	Uppermost raceme	Inflorescence L/raceme L
Maximum	16.6 × 5.0	8.0	19.3	12.5	2.17
Minimum	7.2 × 1.2	1.78	4.1	2.3	1.1
Average	10.8 × 2.7	4.49	10.2	6.3	1.65
SD	2.0 × 1.14	1.70	3.0	2.24	0.26
Variance	4.29 × 1.31	2.79	9.04	5.04	0.07

uous, not geniculate; lower palea absent; upper floret 3.5–3.7 mm long, bisexual, slightly coriaceous, pale, rarely purplish or pale and purplish; upper lemma 3.3–3.5 mm long, obscurely 5-nerved, acute, glabrous to ciliate on the upper ⅓, the cilia few to many in a tuft on each side, 0.5–1.2 mm long, the apex minutely papillate to conspicuously ciliate; upper palea 3.2–3.4 mm long, glabrous, papillose at the apex, rarely smooth; lodicules absent; stamens 3, terminally exserted; anthers 2–2.2 mm long, yellow, rarely purple; ovary 0.4–0.5 mm long, glabrous; styles 2, separate; stigmas plumose, yellow or purple; caryopsis 1.2–1.5 mm long, 0.3–0.5 mm wide; embryo $^4/_{10}$–$^5/_{10}$ as long as the caryopsis; hilum punctate, basal, $^2/_{10}$–$^3/_{10}$ as long as the caryopsis.

Paratypes. BRAZIL. **Goiás:** Niquelândia, Macedo, ca. 18 km N de Niquelândia, campo, 3 ago. 1992, *T. S. Filgueiras & R. D. Lopes 2408, 2409* (IBGE, MO, NY, SI, SP, UFG); same locality, 19 maio 1993, *T. S. Filgueiras & F. C. de A. Oliveira 2450* (CTES, F, G, IBGE, ISC, MO, NY), *2458* (LBP, VEN).

A remarkable degree of variation was observed in this species in such easily visible characters as leaf and raceme size, as well as degree of culm branching. On the basis of ordinary visual comparison, one collection, *Filgueiras & Oliveira 2450*, seemed to differ dramatically from the others in its relatively shorter and narrower leaf blades and racemes, as well as its more profuse branching. This was so conspicuous that we initially had serious doubts that it could be included in the circumscription of this new species. To investigate this variation more thoroughly, we made the following measurements from 60 culms taken from 32 plants of all the gatherings: length and width of the fourth blade below the lowermost raceme, inflorescence length, and the length of the uppermost raceme. The data thus obtained (Table 1) revealed that the variation in these characters is actually continuous among the known gatherings, although the *Filgueiras & Oliveira 2450* gathering occupies the low end of the range of variation and has more branches per culm than the other gatherings.

The occurrence of cilia on the upper lemma is also unusually irregular. The great majority of the spikelets examined showed no cilia on the upper portion of the lemma. However, a small number had as few as 2 to as many as 20 and then formed a tuft of hairs on each side (Fig. 1G, H). Although it is not unusual to observe considerable variation in the amount of pubescence in the lower spikelet bracts of *Paspalum* species, we have never observed much variation in the few species of *Paspalum* [*P. ceresia* (Kuntze) Chase, *P. carinatum* Kunth, *P. heterotrichon* Trinius, *P. hitchcockii* Chase, *P. trachycoleon* Steudel, *P. macroblepharum* Hackel] that have pubescent or puberulent upper lemmas.

The color of the spikelet parts (upper glume, lower lemma, and anthecium) was also found to vary considerably, from pale to purplish to deep purple. A few bicolored (pale and purple) upper florets were also observed.

That awned spikelets are very unusual in the genus has already been discussed (Davidse & Filgueiras, 1993). There seems little doubt that *Paspalum biaristatum* and *P. longiaristatum* are sister species because they share the following characters: 2-awned spikelets, similarly shaped, narrow spikelets, particularly a similar upper glume and lower lemma, texture of upper floret, lack of lodicules, and morphologically similar, racemosely arrayed, winged racemes. These characters firmly place these species in subgenus *Ceresia* (Persoon) Reichenbach (Davidse & Filgueiras, 1993), where they form a distinct group characterized by their 2-awned, narrow spikelets. As these features cannot be found elsewhere in the genus, we here propose a new section of subgenus *Ceresia* to accommodate these two species.

Paspalum sect. **Biaristata** Filgueiras & Davidse, sect. nov. TYPE: *Paspalum biaristatum* Filgueiras & Davidse.

Plantae annuae vel perennes. Rhachis alata, membranacea. Spiculae solitariae, angustae; gluma superior aristata; lemma inferius aristatum. Lodiculae nullae.

TABLE 2. Main distinguishing features of *Paspalum biaristatum* and *P. longiaristatum*.

Character	*Paspalum biaristatum*	*Paspalum longiaristatum*
Habit	perennial	annual
Culms (cm)	73–125	15–36
Blades (cm × mm)	7.2–19.3 × 1.2–5	4–8.2 × 1–2
Racemes (cm)	1.7–13	2–6.8
Spikelets (mm)	3.8–4.5	1.8–2.2
Awn of upper glume (mm)	4–7.1	6–12.2
Awn of lower lemma (mm)	3.8–4.5	0.3–2

Paspalum biaristatum and *P. longiaristatum* are at once easily distinguished by their different stature, life forms, and the other characters summarized in Table 2. Although both species have awned spikelets, the actual and relative size of the spikelets and awns is significantly different: *P. biaristatum* has relatively large spikelets with a relatively smaller awn on the upper glume and a larger awn on the lower lemma, whereas *P. longiaristatum* has smaller spikelets with a longer awn on the upper glume and a much smaller awn on the lower lemma.

Primarily because of its more specialized annual habit, the only occurrence in the subgenus, *P. longiaristatum* is a more specialized species and probably has been derived from *P. biaristatum* or a common ancestor of the two species. The narrow-leafed, more highly branched form as represented by *Filgueiras & Oliveira 2450* varies in the direction of *P. longiaristatum*. As one way to explain this variation, we hypothesize that occasional or even rare hybridization with backcrossing of the hybrid to *P. biaristatum* may occur. This could account for the appearance of these vegetative characters (relatively narrow leaves, high branching) in plants that otherwise look like *P. biaristatum*. This also assumes at least some fertility in the hybrid. Both hypotheses are testable in an experimental garden, and we hope to be able to do this in the future.

Besides *P. longiaristatum*, the closest relationship of *P. biaristatum* to other species seems to lie with those species of subgenus *Ceresia* that have primarily cauline leaves, racemosely arranged racemes, and nerveless, membranous rachis wings. Among these, *P. heterotrichon* is perhaps most similar to *P. biaristatum*. However, besides its awnless spikelets, *P. heterotrichon* differs in its generally shorter and narrower leaf blades, generally more elongated culm internodes, shorter racemes, slightly broader spikelets, nearly glabrous lower lemma that is slightly sulcate on each side of the midnerve, and well-developed lodicules. *Paspalum heterotrichon* has a wide distribution including Panama, Colombia, Venezuela, Peru, Brazil, and Hispaniola. We hypothesize that a species such as *P. heterotrichon* or its progenitor, which occurred on nonserpentine savanna soils, is likely to be the ancestor of the awned species. We, therefore, consider it most likely that the two awned species are recently derived or neoendemic (sensu Brooks, 1987) taxa.

Paspalum biaristatum was found growing in sizeable populations on serpentine soil in an area of approximately 1 km^2, side by side with *P. longiaristatum*. Both species are narrow endemics because their populations are restricted to only a few square meters wherever they occur. Although the Niquelândia complex is quite large, 59 km long and 29 km wide (Berbent et al., 1981), the ultramafic rocks themselves are restricted to a west-dipping zone 2–4 km wide (Brooks et al., 1990). Therefore, though these species may eventually be found in similar habitats along the ultramafic rock belt of central Brazil, the total area of suitable habitat is very small.

The Macedo site in Niquelândia is the center of Brazil's largest nickel mining and smelting operation (Brooks et al., 1990). In fact, at the time the second collection of *P. biaristatum* was being made (August 1992), the collectors could distinctly hear the noise from the tractors working on the nickel mines some 300 m away. It therefore seems that because of their localized occurrence in habitats subject to a great deal of disturbance, both species should be considered to be in imminent danger of extinction.

The descriptive epithet *biaristatum* refers to the characteristic 2-awned spikelets of this species.

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Dudás, San Isidro, Argentina, provided the excellent illustration.

Literature Cited

Berbert, C. O., D. P. Svisero, A. N. Sial & H. O. A. Meyer. 1981. Upper mantle material in the Brazilian Shield. Earth-Sci. Rev. 17: 109–133.

Brooks, R. R. 1987. Serpentine and its Vegetation. A Multidisciplinary Approach. Dioscorides Press, Portland, Oregon.

———, R. D. Reeves, A. J. M. Baker, J. A. Rizzo & H. D. Ferreira. 1990. The Brazilian serpentine plant expedition (Braspex), 1988. Natl. Geogr. Res. 6: 205–219.

Davidse, G. & T. S. Filgueiras. 1993. *Paspalum longiaristatum* (Poaceae: Paniceae), a new serpentine endemic from Goiás, Brazil, and the first awned species in the genus. Novon 3: 129–132.

Lectotypification of Three Names in *Urtica* (Urticaceae)

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ABSTRACT. Three names in *Urtica* described by A. Steudel are lectotypified: *U. pseudodioica*, *U. mollis*, and *U. bracteata*.

Steudel (1850) described several *Urtica* species from South America, using duplicates of the collections of Bertero. For some of these species he cited more than one specimen, and sometimes the syntypes appear to belong to different species; thus lectotypification is necessary.

Bertero specimens are present in many herbaria. By the same reasoning as that of Phillips et al. (1992) concerning holotypes, the names in question can only be lectotypified using the material from P, where the original Steudel material is now deposited (Stafleu & Cowan, 1985).

1. Urtica pseudodioica Steudel, Flora 33: 257. 1850. Lectotype, selected here: "Urtica dioica videtur diversa," ad sepes, secus vias Rancagua Chili, *Bertero 737* (P).

There are at least three sets of specimens in the Bertero collection numbered 737. One of the specimens deposited at P is named "Urtica dioica videtur diversa," and is the specimen cited by Steudel in his description of *U. pseudodioica*. However, it is necessary to be extremely cautious in the recognition of isolectotypes in other herbaria, even if they are named "Urtica dioica videtur diversa." Such a sheet deposited at G belongs in fact to *U. magellanica* Poiret, although the sheet at MO is indeed *U. pseudodioica*.

2. Urtica mollis Steudel, Flora 33: 258. 1850. Lectotype, selected here: In ruderatis, ad sepes in udis Quillota Chili, *Bertero 1382* (P).

In describing this species, Steudel mentioned "Bertero hrbr. 1382 cum sequente mixta." With the next species, *U. bracteata*, he cited "Bertero nr 737 et 1383 ex parte." Indeed, one sheet of *Bertero 1383* in P is marked "U. mollis" and has a "Type" label (the second *Bertero 1382* is *Urtica berteroana* Philippi). Nevertheless, to avoid further misunderstanding I propose to follow the author's first choice in the protologue and to select as the lectotype *Bertero 1382* (P).

3. Urtica bracteata Steudel, Flora 33: 258. 1850. Lectotype, selected here: Ad sepes secus vias Rancagua Chili, *Bertero 737* (P).

This is a second sheet of the *Bertero 737* set. The plant differs from the other sheet by its connate stipules. For details, see comments for the above species.

Extended taxonomic discussions are beyond the scope of the present paper, but some comments are necessary. In my opinion the names *U. mollis* and *U. pseudodioica* (following the lectotypifications here) are applied to the same species. Because both names were published in the same paper and have never previously been synonymized, I accept the name *U. mollis* and treat *U. pseudodioica* as its synonym.

The third sheet of *Bertero 737* at P was identified by Steudel as *U. leptophylla* HBK and in fact belongs to *U. magellanica* Poiret sensu lato. Apparently, this is the sheet taken into account by Navas (1961) as the type of *U. pseudodioica*, because she treated this taxon as closely related to *U. magellanica*.

As here defined *U. magellanica* sensu lato represents a complex of taxa. But the name *U. pseudodioica* cannot be included in this complex, because *U. mollis* and *U. magellanica* are distinct and probably belong to separate sections.

Urtica bracteata is closely related to *U. magellanica*, but differs in its connate stipules. Such plants occasionally can be found in *U. magellanica*, usually with free stipules. At the moment I prefer to treat this taxon as *U. magellanica* var. *bracteata* (Steudel) Weddell; I cannot agree with the suggestions of Navas (1961) to treat *U. bracteata* as a synonym of *U. dioica* L., a Eurasian species, which is more closely related to *U. mollis* than to *U. magellanica*.

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Literature Cited

Navas, E. V. 1961. El género *Urtica* en Chile. Bol. Soc. Argent. Bot. 9: 395–413.

Phillips, S. M., R. K. Brummitt & B. P. J. Molby. 1992. (201–204) Four proposals concerning types with duplicate specimens. Taxon 41: 770.

Stafleu, F. A. & R. S. Cowan. 1985. Taxonomic Literature, 2nd ed., Vol. 5. Reg. Veg. 112: 1–1066.

Steudel, E. G. 1850. *Urticeae* nondum descriptae. Flora 33: 257–261.

Tres Especies Nuevas de *Festuca* (Poaceae: Pooideae) de México

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RESUMEN. Se describen e ilustran tres especies nuevas de *Festuca* de México. *Festuca tancitaroensis* del Cerro Tancítaro, Michoacán, pertenece al subgénero *Asperifolia*. *Festuca coahuilana* de la Sierra de la Madera, Coahuila, y *F. bajacaliforniana* de la Sierra de San Pedro Mártir, Baja California, pertenecen al subgénero *Festuca*.

ABSTRACT. Three new species of *Festuca* from Mexico are described and illustrated. *Festuca tancitaroensis*, from Cerro Tancítaro, Michoacán, belongs to subgenus *Asperifolia*. *Festuca coahuilana*, from the Sierra de la Madera, Coahuila, and *F. bajacaliforniana*, from the Sierra de San Pedro Mártir, Baja California, belong to subgenus *Festuca*.

El tratamiento taxonómico del género *Festuca* L. es difícil, por lo que se acostumbra incluir tanto caracteres morfológicos como anatómicos para la clasificación de los taxa. Para identificar las especies frecuentemente es necesario hacer cortes transversales de la lámina foliar para ver la distribución de esclerénquima, el número de haces vasculares, y la presencia o ausencia de células buliformes, entre otras cosas. También se ha encontrado que los caracteres de la epidermis abaxial de la lámina foliar son de gran utilidad (González-Ledesma, 1991).

En México existen cerca de 30 especies, las cuales habitan casi en su totalidad por arriba de 2,000 m de altitud en bosques templados y en pastizales alpinos. Su representación en los herbarios es deficiente, ya que sólo se han colectado en forma adecuada en algunas áreas del Eje Volcánico Transversal. Las siguientes especies nuevas se encontraron durante el transcurso de una revisión que se está realizando para el país. Las muestras para hacer las observaciones de la anatomía se tomaron del tercio medio de una lámina foliar madura de una innovación.

Festuca tancitaroensis González-Ledesma & S. D. Koch, sp. nov. TIPO: México. Michoacán: Municipality Tancítaro, Mt. Tancítaro, rocky ledge, 10,300 ft., 25 July 1941, *Wm. C. Leavenworth & H. Hoogstral 1213* (holótipo, US; isótipos, CAS, F, MICH). Figura 1.

Herba perennis, dense caespitosa, innovationibus intravaginalibus; culmi 85–130 cm alti, nodi superi nudi 1–2. Vaginae foliorum basales fibrosae. Ligulae 1.5–2.8 mm longae. Laminae foliorum planae vel planiusculae, supra multicostatae, circa 19 nervis, cellulis bulliformibus notabilibus, fasciculis sclerenchymatis cum nervis conjunctis. Paniculae laxae. Spiculae (5)6–8-florae, 15–21 mm longae. Lemmata scabra ad strigosa, (3)5-nervia, 9–12 mm longa, absque arista vel nervo mediano exserto. Antherae (4.0)4.5–5.3 mm longae; ovarium apice glabrum.

Plantas densamente amacolladas, sin rizomas; innovaciones intravaginales; culmos erectos de 85–130 cm de altura, con 1 o 2 de los nudos superiores descubiertos, glabros abajo de la panícula. Vainas glabras, las viejas basales con algunas fibras persistentes cuando están deshaciendose; sin aurículas; lígulas truncadas o algo redondeadas, de 1.5–2.8 mm de largo; láminas planas a ampliamente involutas, largamente atenuadas hacia el ápice, 3.3–6.5 mm de ancho, hasta cerca de 60 cm de largo, superficie adaxial con costillas algo prominentes, superficie abaxial glabra a escabrosa. Panículas abiertas, laxas, 14–35 cm de largo; eje central glabro abajo, escabroso hacia arriba, con 1–3 espiguillas arriba de la última rama; ramas escabrosas o escabrosas-híspidas; nudo inferior con 2 ramas y un total de 11–19 espiguillas. Espiguillas con (5)6–8 flósculos, 15–21 mm de largo; glumas escabrosas a estrigosas, la primera de 4.5–7.5(9.0) mm de largo, la segunda de 6.5–9.5(10.5) mm; lemas escabrosas a estrigosas, con 5 nervios, (8.7)9.0–12.0(12.5) mm de largo, sin arista o con el nervio medio excurrente; lodículas sin lóbulos; anteras de (4.0)4.5–5.3 mm de largo; ápice del ovario glabro; cariopsis de 5.0–7.5 mm de largo.

Sección transversal de la lámina foliar. Láminas planas a ampliamente involutas; superficie adaxial glabra, con costillas prominentes y redondeadas; células buliformes conspicuas; haces vasculares cerca de 19; esclerénquima formando trabas entre los haces vasculares y ambas epidermis.

Epidermis abaxial de la lámina foliar. Zonas costal e intercostal diferenciadas; células largas intercostales con paredes delgadas y lisas; estomas en una hilera cercana a la zona costal; pares de células cortas de corcho y sílice ausentes en la zona intercostal, escasos en la costal; aguijones de la zona

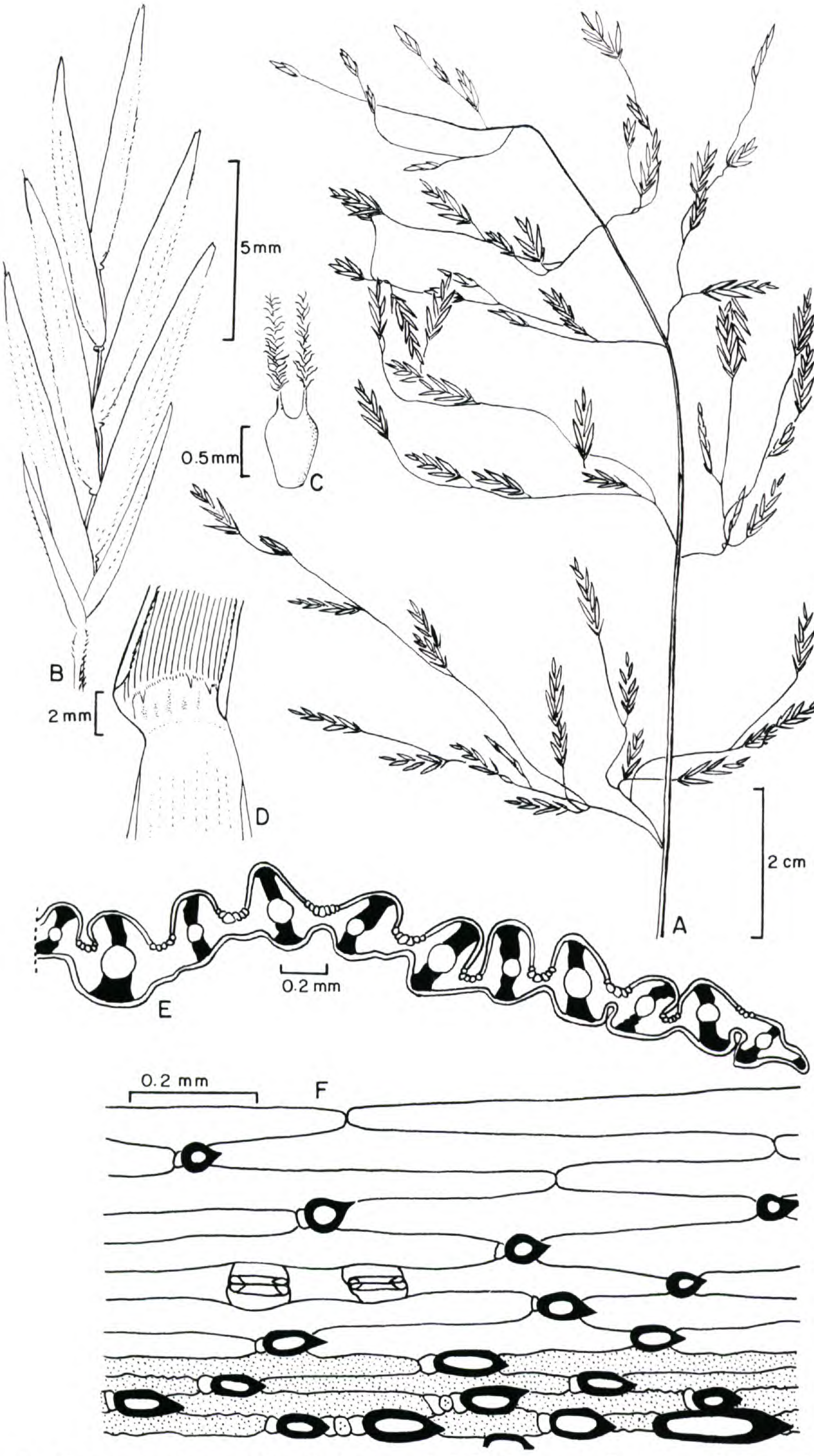

Figura 1. *Festuca tancitaroensis* González-Ledesma & S. D. Koch. —A. Panícula. —B. Espiguilla. —C. Ovario. —D. Lígula. —E. Sección transversal de la lámina foliar. —F. Epidermis abaxial de la lámina foliar. El área sombreada indica la zona costal. De *Leavenworth & Hoogstral 1213* (US).

intercostal presentes entre algunas células largas, con base redonda y púa más corta que la base, los de la zona costal presentes entre todas las células largas, con base alargada y púa notablemente más corta.

Festuca tancitaroensis pertenece al subgénero *Asperifolia*. Esta especie es afín a *F. lugens* (Fournier) Hernández X., de la cual se distingue por sus lígulas de menos de 3 mm de largo (no 3–11 mm), por la presencia de células buliformes notables (no ausentes) en la sección transversal de la lámina foliar, por sus células largas de paredes delgadas y lisas (no gruesas y onduladas), y la presencia de estomas (no ausentes) en la epidermis abaxial de la lámina foliar.

Parátipo. MEXICO. **Michoacán:** Cerro Tancítaro, 11,000 ft., 19 Aug. 1940, *Wm. C. Leavenworth 704* (US).

Festuca coahuilana González-Ledesma & S. D. Koch, sp. nov. TIPO: México. Coahuila: Sierra de la Madera, municipios of Cuatro Ciénegas and Ocampo, Cañón del Agua (N-draining): mid-canyon, 2.5 mi. S of ranchito (which is at mouth of canyon), 27°03′55″N, 102°24′40″W, elev. 1,830 m, limestone canyon-bottom oak woodland, 26 July 1977, *T. Wendt 2042 w/J. Valdés R.* (holótipo, TEX, dos hojas). Figura 2.

Herba perennis, dense caespitosa, innovationibus extravaginalibus et intravaginalibus; culmi 50–60 cm alti, nodus superus nudus. Vaginae foliorum basales non vel parum fibrosae. Ligulae auriculatae, 0.3–0.7 mm longae, auriculae usque ad 1 mm longae. Laminae foliorum planae ad convolutae, 8–11 nervis, cellulis bulliformibus instructae, fasciculis sclerenchymatis inferioribus et superioribus cum nervis primariis confluentibus. Paniculae angustae, rami adpressi. Spiculae 3–5-florae. Lemmata 5-nervia, 5.0–6.2 mm longa, mutica. Antherae 2.5–2.7 mm longae; ovarium apice hispidum.

Plantas amacolladas, con rizomas cortos; innovaciones extravaginales e intravaginales; culmos erectos de 50–60 cm de altura, con el nudo superior expuesto, glabros a escabriúsculos abajo de la panícula. Vainas glabras, las viejas basales sin o con pocas fibras persistentes cuando están deshaciendose; sin aurículas; lígulas cortas, bilobuladas, 0.3–0.7 mm de largo, a veces las superiores del culmo con lóbulos hasta de 1 mm de largo; láminas planas a convolutas, algo flexuosas, 1.5–2.2 mm de ancho o 0.4–0.7 mm de diámetro cuando convolutas, hasta cerca de 25 cm de largo, superficie adaxial con nervios prominentes, escabriúscula, superficie abaxial glabra, lisa al tacto. Panículas estrechas, 8–13 cm de largo; eje central escabroso sobre los ángulos, con 3–5 espiguillas arriba de la última rama; ramas adpresas, escabrosas; nudo inferior con 1–2 ramas y un total de 4–7 espiguillas. Espiguillas con 3–5 flósculos, 7.8–9.2 mm de largo; glumas escabriúsculas hacia el ápice, la primera 2.8–3.5(4.0) mm de largo, la segunda 4.1–6.1 mm; lemas glabras a escabriúsculas, con 5 nervios, 5.0–6.2 mm de largo, sin aristas; lodículas bífidas o laceradas irregularmente; anteras 2.5–2.7 mm de largo; ápice del ovario híspido; cariopsis (inmaduro), cerca de 3.5 mm de largo.

Sección transversal de la lámina foliar. Lámina plana a convoluta, de contorno ligeramente anguloso a redondeado; superficie adaxial con costillas prominentes; células buliformes de tamaño medio; haces vasculares 8–11; esclerénquima formando trabas entre los haces vasculares y ambas epidermis en los haces primarios, en los secundarios y terciarios solamente entre el haz y la epidermis abaxial, o bien, formando hebras.

Epidermis abaxial de la lámina foliar. Zonas costal e intercostal poco diferenciadas; células largas con paredes delgadas y onduladas; estomas ausentes; pares de células cortas de corcho y sílice presentes en ambas zonas, menos frecuentes en la zona intercostal, las de sílice redondas o algunas alargadas horizontalmente en la zona costal; aguijones ausentes.

Festuca coahuilana pertenece al subgénero *Festuca;* sin embargo su ubicación seccional es incierta, ya que no existe una clasificación a este nivel adecuada para los taxa de América. Esta especie sobresale por presentar innovaciones extravaginales e intravaginales, lígulas cortas y bilobuladas, láminas planas a convolutas, lisas al tacto en la superficie abaxial, panículas estrechas, y lemas sin aristas. Ha sido confundida con *F. arizonica* Vasey, de la cual se puede distinguir claramente por la presencia de innovaciones extravaginales e intravaginales (no sólo intravaginales), láminas foliares planas a convolutas (no conduplicadas), con la superficie abaxial glabra y lisa al tacto (no escabrosa a escabriúscula y áspera al tacto), y el eje de la panícula escabroso (no escabroso-pubescente o escabroso-híspido). También se distingue a nivel de anatomía de la lámina porque en corte transversal presenta 8–11 haces vasculares (no 5), trabas de esclerénquima entre los haces vasculares primarios y ambas epidermis (no sólo entre los haces y la epidermis abaxial), y células buliformes presentes (no ausentes).

Festuca coahuilana muestra cierta afinidad con *Festuca rosei* Piper del Eje Volcánico Transversal, por sus láminas foliares glabras en la superficie abaxial y lisas al tacto, su panícula estrecha, y sus lemas sin aristas. Sin embargo, en general, *F. coa-*

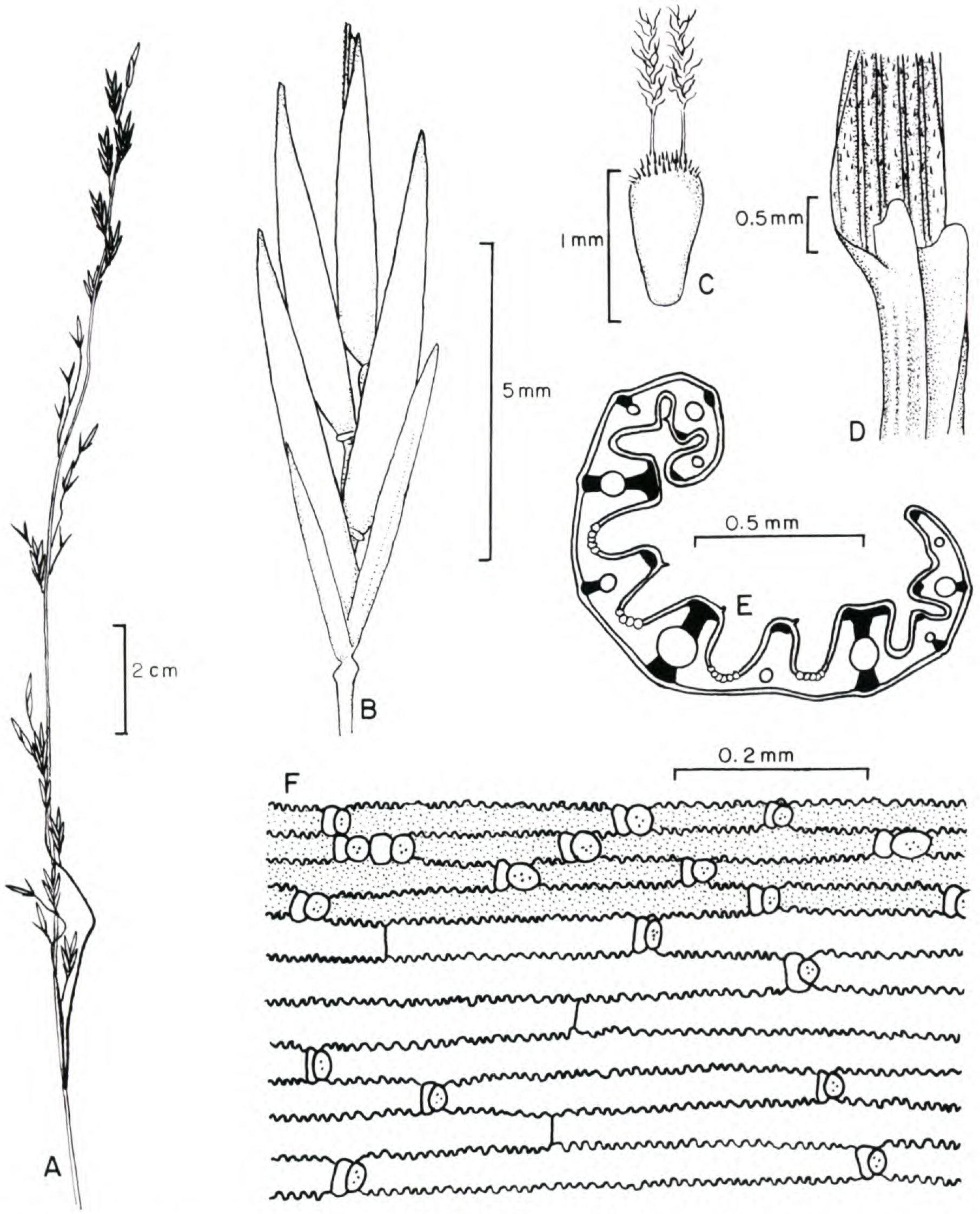

Figura 2. *Festuca coahuilana* González-Ledesma & S. D. Koch. —A. Panícula. —B. Espiguilla. —C. Ovario. —D. Lígula. —E. Sección transversal de la lámina foliar. —F. Epidermis abaxial de la lámina foliar. El área sombreada indica la zona costal. De *T. Wendt 2042 w/J. Valdés* (TEX).

huilana es de porte menor y es menos robusta. Además tiene las lígulas bilobadas (no truncadas), la panícula de 8–13 cm (no (15)18–30(40) cm) de largo, un total de 4–7 espiguillas en las ramas del nudo inferior de la panícula (no (9)20–50), anteras de 2.5–2.7 mm de largo (no 3.2–4.0(4.4) mm), y el ápice del ovario híspido (no glabro). A nivel anatómico se diferencia por la presencia de células buliformes, las cuales son ausentes en F. rosei.

La etiqueta del holotipo, *Wendt 2042*, indica que esta colecta es igual a *Valdés R. 1033*, y la del paratipo, *Wendt 2062*, indica que es igual a *Valdés R. 1056*. No se vió ningún ejemplar de estas otras colectas.

Parátipo. MEXICO. **Coahuila:** Sierra de la Madera, municipios of Cuatro Ciénegas and Ocampo, Cañón del Desiderio (N-draining): mid-canyon, 1.5 mi. down (N) from upper lumber camp, in E fork, 9.4 mi. by winding road W from Rancho Cerro de la Madera, 27°07′45″N, 102°31′30″W, elev. 2,150 m, mesic limestone canyon woodland, 27 July 1977, *T. Wendt 2062 w/J. Valdés R.* (MEXU, TEX).

Festuca bajacaliforniana González-Ledesma & S. D. Koch, sp. nov. TIPO: México. Baja California: Sierra de San Pedro Mártir, N slope of Cerro "2828," near 31°02′N, 115°27′W, ca. 2,800 m, 14 Sep. 1968, *R. Moran 15619* (holótipo, ENCB; isótipos, LL, MICH, MSC, SD, TAES, US). Figura 3.

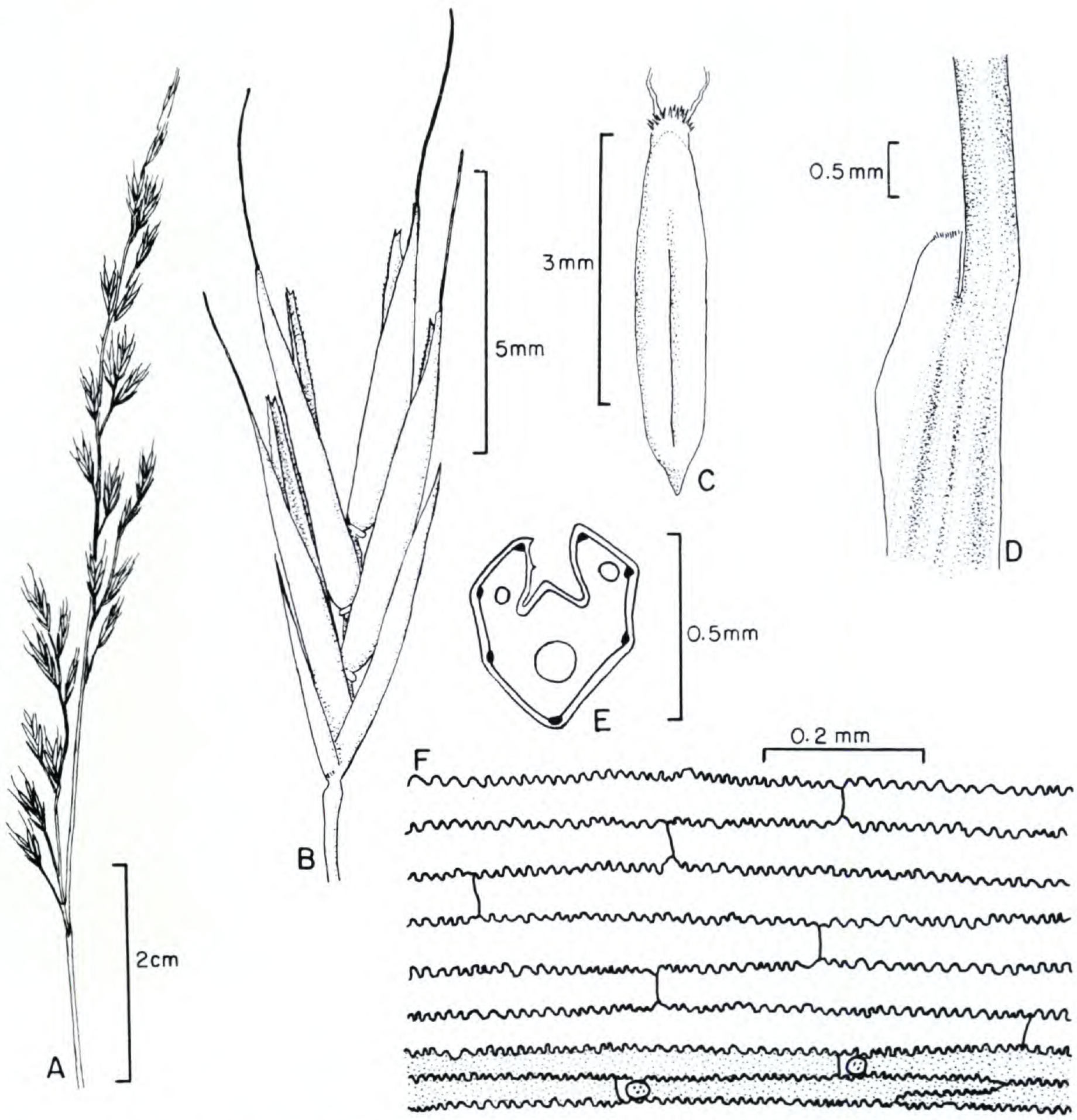

Figura 3. *Festuca bajacaliforniana* González-Ledesma & S. D. Koch. —A. Panícula. —B. Espiguilla. —C. Cariopsis. —D. Lígula. —E. Sección transversal de la lámina foliar. —F. Epidermis abaxial de la lámina foliar. El área sombreada indica la zona costal. De *Moran 15619* (SD).

Herba perennis, dense caespitosa, innovationibus intravaginalibus; culmi usque ad 50 cm alti, geniculati, nodi superiori nudi 1–2. Vaginae foliorum basales non fibrosae. Ligulae 0.4–1.3 mm longae, truncatae ad bilobatae. Laminae foliorum conduplicatae, intus unicostatae, extus angulosae, 3-nerves, fasciculis sclerenchymatis discreti et abaxialis 7. Paniculae angustae. Spiculae 4–6-florae. Lemmata 3-nervia, 5.3–6.7 mm longa, aristis 2.0–4.5 mm longis. Antherae 2.0–2.3 mm longae; ovarium apice hispidum.

Plantas densamente amacolladas, sin rizomas; innovaciones intravaginales; culmos geniculados de 15–50 cm de altura, 1–2 nudos superiores expuestos y de color púrpura, glabros abajo de la panícula. Vainas glabras, las viejas basales sin fibras persistentes cuando están deshaciendose; sin aurículas; lígulas truncadas a bilobuladas, cortamente ciliadas, 0.4–1.3 mm de largo, la mayoría cerca de 0.5 mm; láminas conduplicadas, de contorno anguloso, 0.4–0.6 mm de diámetro, 3–15 cm de largo, superficie adaxial escabrosa, superficie abaxial glabra, lisa al tacto. Panícula estrecha, excepcionalmente reducida a un racimo, 4–9 cm de largo; eje central glabro, escabriúsculo hacia el ápice, con 5–8 espiguillas arriba de la última rama; ramas adpresas, escabriúsculas a escabrosas sobre los ángulos; nudo inferior con 1–2 ramas y un total de 4–6 espiguillas. Espiguillas con 4–6 flósculos, 7.8–9.8 mm de largo; glumas escabriúsculas en el ápice, la primera 2.6–4.0 mm de largo, la segunda 4.4–5.1 mm; lemas escabriúsculas o escabrosas hacia el ápice, con 3 nervios evidentes, 5.3–6.7 mm de largo, con aristas de 2.0–4.7 mm; lodículas bífidas; anteras de 2.0–2.3 mm de largo; ápice del ovario híspido; cariopsis de 4.2–4.5 mm de largo.

Sección transversal de la lámina foliar. Lámina conduplicada de contorno anguloso; superficie ad-

axial con una sola costilla; haces vasculares 3, el central notablemente más grande; esclerénquima en 7 hebras aisladas hacia la superficie abaxial, y en los margenes.

Epidermis abaxial de la lámina foliar. Zonas costal e intercostal diferenciadas; células largas intercostales con paredes medianamente gruesas y onduladas; pares de células cortas de corcho y sílice presentes en la zona costal y ausentes en la intercostal, células de sílice redondas o un poco alargadas horizontalmente; aguijones ausentes.

Festuca bajacaliforniana pertenece al subgénero *Festuca*, y la mayoría de sus características la ubican dentro de la sección *Festuca*. Los ejemplares pertenecientes a esta especie no son considerados en la revisión más reciente del género para México (Alexeev, 1984). Gould & Moran (1981) en su tratado sobre las gramíneas de Baja California las consideran como *F. ovina* L. Sin embargo, diversos autores (Tsvelev, 1983 [1976]; Alexeev, 1982; Pavlick, 1984) indican que *F. ovina* sensu stricto presenta láminas foliares de contorno redondeado, sección transversal oval u oboval, esclerénquima formando una banda subepidérmica abaxial continua, (5)7 haces vasculares, y el ápice del ovario glabro. *F. bajacaliforniana*, en cambio, presenta láminas foliares de contorno anguloso, sección transversal hexagonal, esclerénquima formando 7 hebras aisladas, 3 haces vasculares, y el ápice del ovario híspido, entre otras características que la distinguen claramente de aquella y de otros taxa del complejo *F. ovina* de Norteamérica.

Parátipos. MEXICO. **Baja California:** Sierra de San Pedro Mártir, E slope of Cerro "2828," on E rim, near 31°02′N, 115°27′W, ca. 2,800 m, 24 Aug. 1968, *R. Moran 15409* (SD, TAES); Cerro "2828," near observatory, near 31°02′N, 115°29′W, ca. 2,475 m, 9 Aug. 1969, *H. V. Withman 412* (SD); Cerro Venado Blanco, S summit ridge, near 31°05′N, 115°29′W, ca. 2,750 m, 15 Sep. 1968, *R. Moran 15639* (CAS, SD, TAES); Cerro Venado Blanco, S summit ridge, ca. 2,750 m, 15 Sep. 1968, *R. Moran 15652* (SD, TAES).

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Literatura Citada

Alexeev, E. B. 1982. New and little-known fescues (*Festuca* L.) of North America. (En ruso y latín). Byull. Mosk. Obshch. Ispyt. Prir. 87: 109–118.

———. 1984. Genus *Festuca* L. (Poaceae) in Mexico et America Centrali. (En ruso y latín). Novit. Syst. Pl. Vasc. 21: 25–60.

González-Ledesma, M. 1991. Revisión del Género *Festuca* L. (Gramineae) en el Eje Volcánico Transversal. Tesis de Maestría en Ciencias. Colegio de Postgraduados, Montecillos, Edo. de México, México.

Gould, F. W. & R. Moran. 1981. The Grasses of Baja California, México. San Diego Soc. Nat. Hist., Mem. 12.

Pavlick, L. E. 1984. Studies on the *Festuca ovina* complex in the Canadian Cordillera. Canad. J. Bot. 62: 2448–2462.

Tsvelev, N. N. 1983. The Grasses of the Soviet Union. Amerind Publishing, New Delhi. Traducido del ruso (ed. 1976) por B. R. Sharma.

The Dzungarian Yellow-flowered Species of *Limonium* (Plumbaginaceae)

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ABSTRACT. The distinguishing characters between the closely related *Limonium chrysocomum* and *L. semenovii* are given. The new combinations *L. semenovii* var. *chrysocephalum* and *L. semenovii* var. *sedoides* are proposed, and a key separating these varieties is presented.

Limonium chrysocomum (Karelin & Kirilov) Kuntze and *L. semenovii* (Herder) Kuntze are very closely related yellow-flowered species that have long been confused. The former grows in rocky areas in deserts and on dry stony slopes, hills, and low mountains in northern Xinjiang and Dzungarian Gobi (western Mongolia, Kazakhstan). In contrast, *L. semenovii* grows in desert and steppe stony slopes, hills, and low mountains, on salt sands, *Haloxylon* desert woodlands, and scree, especially on tertiary gypsum deposits, and is distributed in Xinjiang (north and south foothills of Tian-Shan), Dzungarian Alatau, and Gobi (eastern Kazakhstan, western Mongolia). The two species can be separated by the following key:

1a. Stems and branches finely warty at least just below inflorescence; external bractlets of spikes glabrate, very rarely pilose in the eastern plants (var. *pubescens* Linczevski) .... *L. chrysocomum*
1b. Stems and branches glabrate; external and internal bractlets of spikes almost always densely and long pilose, very rarely glabrous in the western part of the species range (var. *glabra* Linczevski) ..... *L. semenovii*

Limonium chrysocephalum (Regel) Linczevski and *L. sedoides* (Regel) Kuntze are best treated as varieties of *L. semenovii* and not *L. chrysocomum*, as was done by Peng (1987). They are not sharply differentiated, and a whole range of intermediates occurs sporadically within the general range of *L. semenovii*. The two varieties are separated as follows:

1a. Sterile branches 2 or 3, not more than twice as long as membranaceous scales; plants 10–15 cm high ..... var. *chrysocephalum*
1b. Sterile branches often solitary, completely covered by white membranaceous scales; plants 2–6 cm high ..... var. *sedoides*

Limonium semenovii (Herder) Kuntze var. **chrysocephalum** (Regel) Grubov, comb. nov. Basionym: *Statice chrysocephala* Regel, Trudy Imp. S. Peterburgsk. Bot. Sada 6: 383. 1880. TYPE: China. Xinjiang: Tian-Shan, Borborogussun, 3,000–4,000 ft., 28 Apr. 1879, *A. Regel s.n.* (holotype, LE).

Limonium semenovii (Herder) Kuntze var. **sedoides** (Regel) Grubov, comb. nov. Basionym: *Statice sedoides* Regel, Trudy Imp. S. Peterburgsk. Bot. Sada 6: 384. 1880. TYPE: China. Xinjiang: Sudabhang des dschungarischen Alatau, 6,000 ft., 7 Aug. 1878, *A. Regel s.n.* (holotype, LE).

Although the original publication of *Statice chrysocephala* and *S. sedoides* cited more than one collection for each, the author clearly selected the types above, as evidenced by his own handwriting on the sheets at LE.

Acknowledgments. I thank Alice Grabovskaya and Ihsan Al-Shehbaz for help in the preparation of the manuscript.

Literature Cited

Peng, T.-X. 1987. Plumbaginaceae. *In:* Lee, S.-K. (editor), Fl. Reipubl. Popularis Sinica 60(1): 1–47.

A New Species of *Zapoteca* (Leguminosae, Mimosoideae) from Mexico

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ABSTRACT. *Zapoteca sousae* (Leguminosae, Mimosoideae), a new species from Oaxaca and Colima, Mexico, is described and illustrated. It appears to be closely related to the widespread and highly variable *Zapoteca portoricensis*, from which it differs primarily by stipule, flower, and leaf characters.

RESUMEN. Se describe e ilustra *Zapoteca sousae* (Leguminosae, Mimosoideae), una especie nueva de Oaxaca y Colima, México. Esta especie parece estar íntimamente relacionada con *Z. portoricensis*, de la cual difiere principalmente en caracteres de las estípulas, flores, y hojas.

Zapoteca H. Hernández (Leguminosae, Mimosoideae, tribe Ingeae) is a genus of neotropical shrubs recently segregated from *Calliandra* (Hernández, 1986). According to Hernández (1989, 1990), it comprises 18 species and 11 subspecies grouped into five subgenera. The highest concentration of taxa is in southern Mexico, particularly in the states of Oaxaca and Chiapas.

During a floristic survey of a small portion of the Sierra Madre del Sur, being carried out by A. Campos (en prep.), the following new species was found. We take pleasure in naming it in honor of Mario Sousa Sánchez, in acknowledgment of his important contributions to our knowledge of the Mexican Leguminosae, particularly those of the State of Oaxaca.

Zapoteca sousae H. Hernández & A. Campos, sp. nov. TYPE: Mexico. Oaxaca: Distr. Miahuatlán, Mpio. San Jerónimo Coatlán, 29 km al SO de San Jerónimo Coatlán, brecha a Piedra Larga, 16°11′N, 96°59′W, 1,500 m, 12 jul. 1992, *A. Campos V. 4765* (holotype, MEXU; isotypes IEB, MEXU, MO, XAL). Figure 1.

Frutices erecti, caulibus gracilibus. Stipulae foliaceae, caducae, juveniles lanceolatae, maturantes conspicue cordiformes, apice acutae vel cuspidatae, 26 mm usque longae, basi 17 mm latae, parallelinerviae. Calycis dentes inaequales, lineari-lanceolati vel lanceolati, acuti, 1.5–4 mm longi. Corolla infundibularis, 7–8.5 mm longa.

Erect shrubs, to 3 m tall; stems slender, to 1.3 cm diam. at the base; branchlets terete, costate under magnification, villous to densely villous with tawny hairs, especially apically. Leaves with petiole (1.5–)3–6.7 cm long; rachis 11–16.5 cm long; pinnae (5–)7–11-jugate, with rachilla 5–10 cm long; leaflets 18–33 pairs per pinna, narrowly oblong, the proximal ones cuneate at the base, becoming obliquely truncate proximally, acute at the apex, mucronate, 5.5–13 × 1–2.5 mm, the proximal ones smaller, mostly glabrous, but with a few white hairs at the base of the abaxial surface, ciliate, membranous, venation pattern visible superficially. Stipules foliaceous, caducous, lanceolate when young, becoming conspicuously cordiform, acute to cuspidate at the apex, to 26 mm long, 17 mm wide at the base, sparsely villous with tawny hairs, membranous, parallel-veined. Capitula axillary, peduncles fasciculate, slender, 2.8–5.5 cm long at anthesis, villous. Flowers pentamerous, each subtended by a lanceolate, 3–6 × 1–2 mm, sparsely villous bract; calyx campanulate, 3–6 mm long, green, glabrous, the teeth linear-lanceolate to lanceolate, acute, 1.5–4 mm long, unequal; corolla infundibular, 7–8.5 mm long, greenish white, glabrous, the lobes lanceolate, 4–4.5 mm long; filaments 3.5–4 cm long, white, the staminal tube 2–3 mm long; ovary ca. 1.5–3 mm long, glabrous; stigma cup-shaped. Pods elastically dehiscent, linear, straight before dehiscence, the apex rounded or acute, rostellate, to 12 × 0.8 cm when mature, thickly membranous, glabrous. Seeds broadly rhomboid, 6 × 4–5 mm, dark brown, the areola mottled; pleurogram irregular.

Distribution and habitat. Known only from two widely disjunct localities in Oaxaca and Colima, Mexico. In Oaxaca it appears to be restricted to undisturbed sites with montane mesophyllous forest (sensu Rzedowski, 1978).

Zapoteca sousae is closely allied to *Z. portoricensis* (Jacquin) H. Hernández, particularly to its subspecies *portoricensis*. It can be distinguished from this taxon, and from the remaining members of the genus, primarily by its characteristic stipules and by its calyx with unequal teeth (Fig. 1), features which appear to be unique in the genus. Additional distinguishing features of the Oaxacan population of *Z. sousae* are the numerous pairs of pinnae, and the longer petiole and rachis. The specimen from

Figure 1. *Zapoteca sousae* H. Hernández & A. Campos. —A. Branchlet with inflorescences at anthesis. —B. Flower. —C. Dissected calyx. —D. Pods. —E. Seed. (A–C from *A. Campos 4765*, MEXU; D, E from *A. Campos & I. Calzada 4922*, MEXU.)

Colima has smaller leaf characters, approaching those of the typical *Z. portoricensis*.

Zapoteca sousae has been collected in the same area as *Z. portoricensis* subsp. *portoricensis* (*E. Martínez et al. 2544*); however, these two taxa are not known to grow side by side, and no morphologically intermediate individuals have been detected. The known populations of *Z. sousae* appear to be restricted to undisturbed ravines, whereas the Mexican representatives of *Z. portoricensis* subsp. *portoricensis* usually grow in secondary habitats derived from montane mesophyllous forests.

Paratypes. MEXICO. **Oaxaca:** Distr. Miahuatlán, Mpio. San Jerónimo Coatlán, 29 km al SO de San Jerónimo Coatlán, brecha a Piedra Larga, 16°11′ N, 96°59′ W, alt. 1,500 m, *A. Campos & I. Calzada 4922* (MEXU). **Colima:** Paso del Río, *G. M. Emrick 244* (F).

Acknowledgments. We are grateful to Fernando Chiang for the Latin diagnosis and for carefully reading the manuscript, and to Albino Luna for the illustration.

Literature Cited

Hernández, H. M. 1986. *Zapoteca:* A new genus of neotropical Mimosoideae. Ann. Missouri Bot. Gard. 73: 755–763.

———. 1989. Systematics of *Zapoteca* (Leguminosae). Ann. Missouri Bot. Gard. 76: 781–862.

———. 1990. A new subgenus and a new species of *Zapoteca* (Leguminosae). Syst. Bot. 15: 226–230.

Rzedowski, J. 1978. Vegetación de México. Limusa, México.

A New Species of *Selysia* (Cucurbitaceae) from Mesoamerica and a Synopsis of the Genus

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ABSTRACT. A new Panamanian species, *Selysia bidentata*, is described and illustrated, and a key to and a synopsis of *Selysia* are provided. The new species is closely related to *S. smithii*, which occurs from Colombia to Peru in the Andes. This species raises the number of species in *Selysia* to four.

While preparing an account of *Selysia* for *Flora Mesoamericana*, the following new species was identified. It is most similar morphologically to *S. smithii* (Standley) C. Jeffrey from Andean South America and to *S. prunifera* (Poeppig & Endlicher) Cogniaux: differences between the species are detailed in the discussion.

Selysia bidentata R. J. Hampshire, sp. nov. TYPE: Panama. Comarca de San Blas: El Llano–Cartí road, 16–20 km from Interamerican Hwy., 9°19′N, 78°55′W, 6 Sep. 1984 (fr), *de Nevers 3855* (holotype, BM; isotype, MO). Figure 1.

Species *S. pruniferae* (Poeppig & Endlicher) Cogniaux similis, sed seminibus apice bidentatis haud acutis, petiolis villosis nec glabris nec breve pubescentibus.

Monoecious vines; stems sulcate, sparsely pilose to villous; tendrils bifid, often with one branch more robust. Leaves 8–15(–19) × 7–15(–18.5) cm, simple entire and cordate or deeply 3-lobed and broadly ovate to suborbicular, apically acuminate, basally deeply cordate, the margin minutely and remotely denticulate, adaxially glabrate to sparsely tomentose, the veins raised and densely villous, abaxially tomentose; petiole 2.0–2.4(–3.8) cm, loosely villous with straw-colored trichomes 4–5 mm long. Staminate flowers 1–2 in leaf axils; peduncles 3.5–5.2 cm, villous; receptacle conical, villous; calyx 5-lobed, the lobes ca. 6 mm, narrrowly triangular; corolla white, campanulate, the lobes ca. 1.3 cm, lanceolate, the margins inrolled, pubescent without, tomentose within. Pistillate flowers 1–2 in leaf axils, only buds seen; ovary ca. 5 mm diam., subglobose, densely tomentose; receptacle cylindrical to subglobose, ca. 3 mm long, calyx lobes 1.5–2 mm, linear; corolla lobes ca. 6 mm in bud. Fruiting peduncle 4.6–8 cm long, fruit ca. 2.4 cm diam., subglobose, indehiscent, the surface smooth to sparsely short-pubescent, changing from green to red at maturity; seeds 6–9 per fruit, 13–15 × 8–10 mm, erect, ovate, apically 2-dentate, basally 3-dentate, compressed, black or dark brown, the surface minutely pitted.

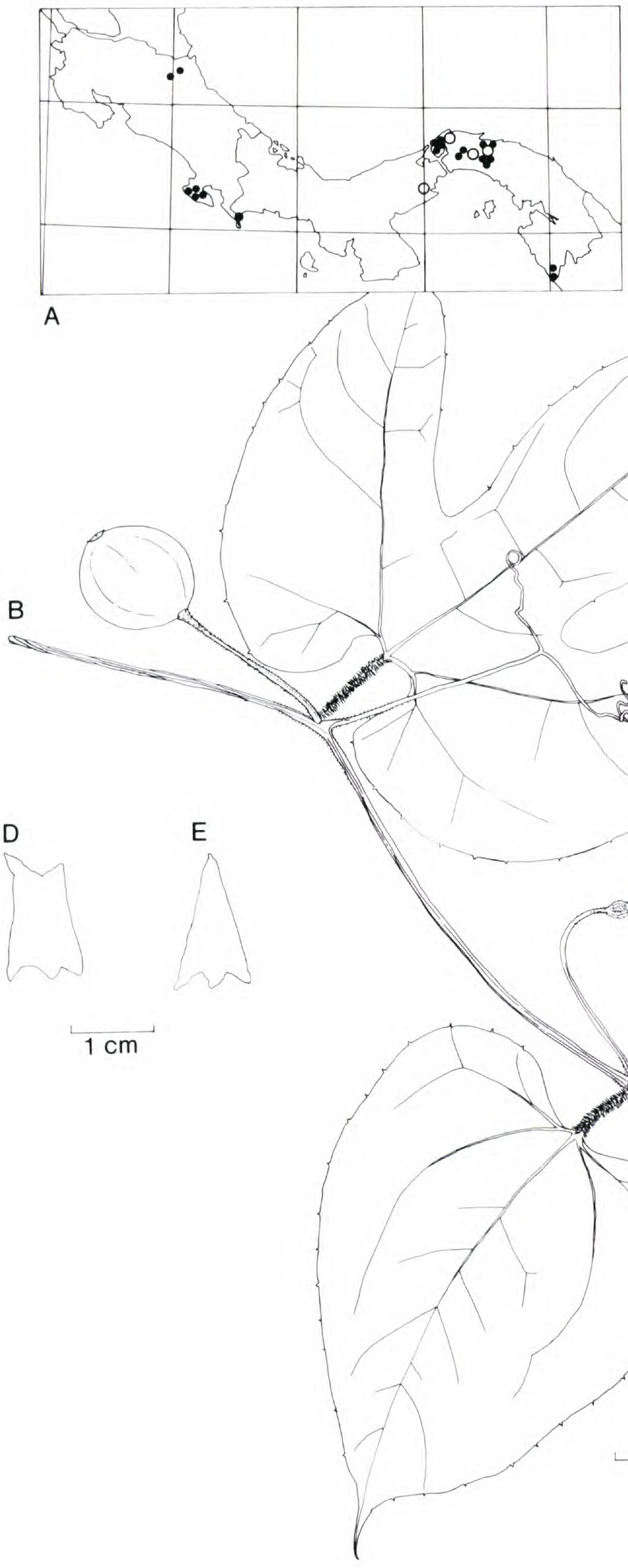
Selysia bidentata occurs in disturbed forest near roads, streams and trails from 100 to 850 m elevation. A single male flower has been seen (*de Nevers et al. 5462*, MO), but it has not been dissected.

Selysia bidentata is easily distinguished from other species of *Selysia* by its apically bidentate seeds. All other described species in the genus have arrowhead-shaped seeds, with three basal teeth and a single apical point. The epithet "bidentata" refers to this unusual seed shape.

Selysia bidentata is morphologically most similar to *S. smithii* of Andean South America. The two species both have densely villous petioles and sparsely pubescent fruits. Both species also have occasional (in *S. smithii* usually) simple leaves. The petiole pubescence of *S. bidentata* is much longer and looser than that of *S. smithii* and the trichomes are straw-colored rather than ferrugineous. The leaves of *S. smithii* are thick and coriaceous, while those of *S. bidentata* are thinner and more membranous in texture.

The only other Mesoamerican species of *Selysia* is *S. prunifera*, which is easily distinguished from *S. bidentata* by its seed shape and longer, glabrous or minutely pubescent petioles. The petioles of *S. prunifera* exceed 3 cm in length, while those of *S. bidentata* are usually less than 2.4 cm (with rare exceptions).

Paratypes. PANAMA. **Colón:** trail and streamside where Río Escandaloso meets Río Boqueron, 300 ft., 13 Apr. 1978, *Hammel 2487* (K, MO); along Río Escandoloso and Río Boqueron near their juncture, 28 Apr. 1978, *Hammel 2740* (MO). **Comarca de San Blas:** Cerro Brewster, premontane rainforest, 850 m, 21 Apr. 1985, *de Nevers et al. 5462* (MO). **Panamá:** Cerro Jefe to La Eneida, ca. 3,100 ft., 17 Jan. 1968, *Dwyer et al. 8207* (MO); Cerro Campana, summit and upper trail, 19 Sep. 1975, *Witherspoon & Witherspoon 8469* (MO).


A
B
C
D
E
1 cm
1cm
5cm

KEY TO THE SPECIES OF *SELYSIA*

1a. Petioles short-pubescent to glabrous, the trichomes to 0.5 mm long.
  2a. Leaves with thick tufts of white trichomes in axils of main veins immediately above the petiole insertion point; leaf blades cordate, unlobed ..... 2. *S. cordata*
  2b. Leaves without tufts of trichomes in axils of main veins; leaves variously cordate to trilobed ..... 1. *S. prunifera*
1b. Petioles villous with long, uniseriate trichomes, the trichomes to 5 mm long.
  3a. Petiole trichomes 4–5 mm long, loose, straw-colored; leaves membranous ..... 4. *S. bidentata*
  3b. Petiole trichomes 2–3 mm long, very dense, ferrugineous; leaves coriaceous... 3. *S. smithii*

SYNOPSIS OF *SELYSIA* COGNIAUX IN A. DC., MONOGR. PHAN. 3: 735. 1881.

1. *Selysia prunifera* (Poeppig & Endlicher) Cogniaux in A. DC., Monogr. Phan. 3: 736. 1881. *Melothria prunifera* Poeppig & Endlicher, Nov. Gen. Sp. Pl. 2: 55, t. 174. 1838. TYPE: Peru. Loreto: Maynas, *Poeppig 2265* (holotype, W).

Distribution. Costa Rica to Amazonian Peru.

2. *Selysia cordata* Cogniaux in A. DC., Monogr. Phan. 3: 736. 1881. TYPE: Colombia. Boyacá: Muzo, *Goudot s.n.* (holotype, P).

Distribution. Northern Colombia in the departments of Santander and Boyacá.

3. *Selysia smithii* (Standley) C. Jeffrey, Kew Bull. 25(2): 235. 1971. *Cayaponia smithii* Standley, Publ. Field Mus. Nat. Hist. Bot. Ser. 13(6): 380. 1937. TYPE: Peru. Loreto: Río Morona, *Killip & Smith 29162* (holotype, US).

Distribution. Andean Colombia to Peru.

4. *Selysia bidentata* R. J. Hampshire. TYPE: Panama. Comarca de San Blas: El Llano–Cartí road, *de Nevers 3855* (holotype, BM).

Distribution. Central Panama.

Acknowledgments. We thank C. Jeffrey (K) for advice, N. K. B. Robson (BM) for help with the Latin diagnosis, and an anonymous reviewer for helpful comments as to relationships in the genus.

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Figure 1. *Selysia bidentata* R. J. Hampshire. —A. Map of Costa Rica and Panama showing the distribution of *S. bidentata*, solid circles, and *S. prunifera*, open circles. —B. Habit of *S. bidentata*, with female flower and fruit (from *de Nevers 3855*, BM). —C. Male flower (from *de Nevers et al. 5462*, MO). —D. Seed of *S. bidentata* (from *de Nevers 3855*, BM). —E. Seed of *S. prunifera* (from *Kernan 692*, BM).

New Species of *Ardisia* (Myrsinaceae) from the Cordillera Occidental of Colombia and Ecuador

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ABSTRACT. Studies of the vegetation of Parque Nacional Natural "Las Orquídeas" and surrounding areas, located at the junction of Antioquia and Chocó departments, on the western slopes of the Cordillera Occidental, have revealed two new species of *Ardisia* Swartz. These species, *Ardisia mcphersonii* and *A. cardenasii*, are described and illustrated, and their phylogenetic relationships are discussed. Another new species, *A. pluvialis*, from the Chocó Floristic Province of northwestern Ecuador at the foothills of the western slope of the Cordillera Occidental, is also described and illustrated, and a key to distinguish it from its two most closely related congeners is provided.

The Cordillera Occidental of the Andes, and the adjacent Chocó Floristic Province of Colombia and Ecuador, are the home of some of the richest tropical forests on earth (Cuatrecasas, 1958; Forero, 1982, 1988, 1989; Gentry, 1982, 1987). Under the auspices of a grant from the National Geographic Society, the Fundación Jardín Botánico, "Joaquín Antonio Uribe," and the Missouri Botanical Garden are documenting the plant diversity of Parque Nacional Natural "Las Orquídeas," comprising 32,000 hectares on the western slopes of the Cordillera Occidental, along the border of Antioquia and Chocó departments. Determination of specimens from that project, along with other *Ardisia* specimens from the Chocó of Ecuador, has resulted in the discovery of three new species, described herein.

Ardisia mcphersonii Pipoly, sp. nov. TYPE: Colombia. Antioquia: Mcpio. de Frontino, Murrí, W-Central part of Antioquia, 15 km from Nutibarra, 6°40′N, 76°20′W, 1,875 m, 3 Nov. 1988 (fl), *G. McPherson et al. 12954* (holotype, HUA; isotypes, MO, US). Figure 1.

Propter laminas oblongas vel anguste ellipticas ad apices basesque acuminatas, inflorescentiam terminalam tripinnatipanniculatamque, margines sepalinos hyalinos erosos ciliatosque, antheras lanceoloideas, ovulos numerosos pluriseriatosque *A. gentryi* Lundell valde arcte affinis, sed ab ea inflorescentiae rhachidi recta (non geniculata), trichomatibus stellatis (nec furfuraceo-lepidotis) induta, pedicellis teretibus (nec obconicis), denique laminis desuper manifeste atro-(non inconspicue pellucido-) punctatis statim distinguitur.

Tree to 6 m tall; branchlets subterete, 5–7 mm diam., densely rufous stellate-tomentose, the tomentum persistent. Leaves chartaceous, the blades oblong to narrowly elliptic, 18–33 cm long, 5.8–8.5 cm wide, apex abruptly acuminate, the acumen 1.2–1.5 cm long, base acute, decurrent on the petiole, costa impressed and sparsely tomentose above, prominently raised and densely stellate tomentose below, secondary veins 30–38 pairs, slightly raised above and below, densely and prominently black punctate and minutely scrobiculate above, fufuraceous lepidote and stellate tomentose below, the margin revolute; petioles canaliculate, 1.2–1.5 cm long, sparsely tomentose above, densely tomentose below, the tomentum persistent. Inflorescence terminal, tripinnately pyramidal-paniculate, 21–30 cm long, 20–30 cm wide, the lower branches subtended by leaves, the rachis and pedicels densely rufous stellate-tomentose, primary and secondary axes straight; inflorescence bract and secondary branch bracts unknown; floral bracts chartaceous, lanceolate, 1–1.4 mm long, 0.3–0.4 mm wide, apex attenuate, densely rufous glandular-papillate above and below, the margin entire, early caducous; pedicels terete, 1.2–1.8 mm long, densely rufous glandular-papillate. Flowers corymbose, 5-merous, cream; calyx chartaceous, the sepals essentially free, chartaceous, ovate, 1.4–1.8 mm long, 1.7–1.9 mm wide, apex rounded to acutish, asymmetric, auriculate on one side, densely and minutely red glandular-papillate without, glabrous within, densely and prominently black punctate, the margin hyaline, erose, ciliate; corolla coriaceous, the petals free, oblong, 4.2–4.4 mm long, 1–1.2 mm wide, apex acuminate, asymmetric, glabrous, densely and prominently black punctate, the margin hyaline, irregular, entire, glabrous; stamens 2.8–3 mm long, the filaments flat, 1–1.2 mm long, inserted at the bases of the petals, basally widened, glabrous, the anthers subversatile, lanceoloid, 2.4–2.6 mm long, 1–1.2 mm wide, apex apiculate, base sagittate, dehiscent by wide longitudinal slits, the connective epunctate; pistil 3.5–3.9 mm long, the ovary subglobose, 1.4–1.6 mm

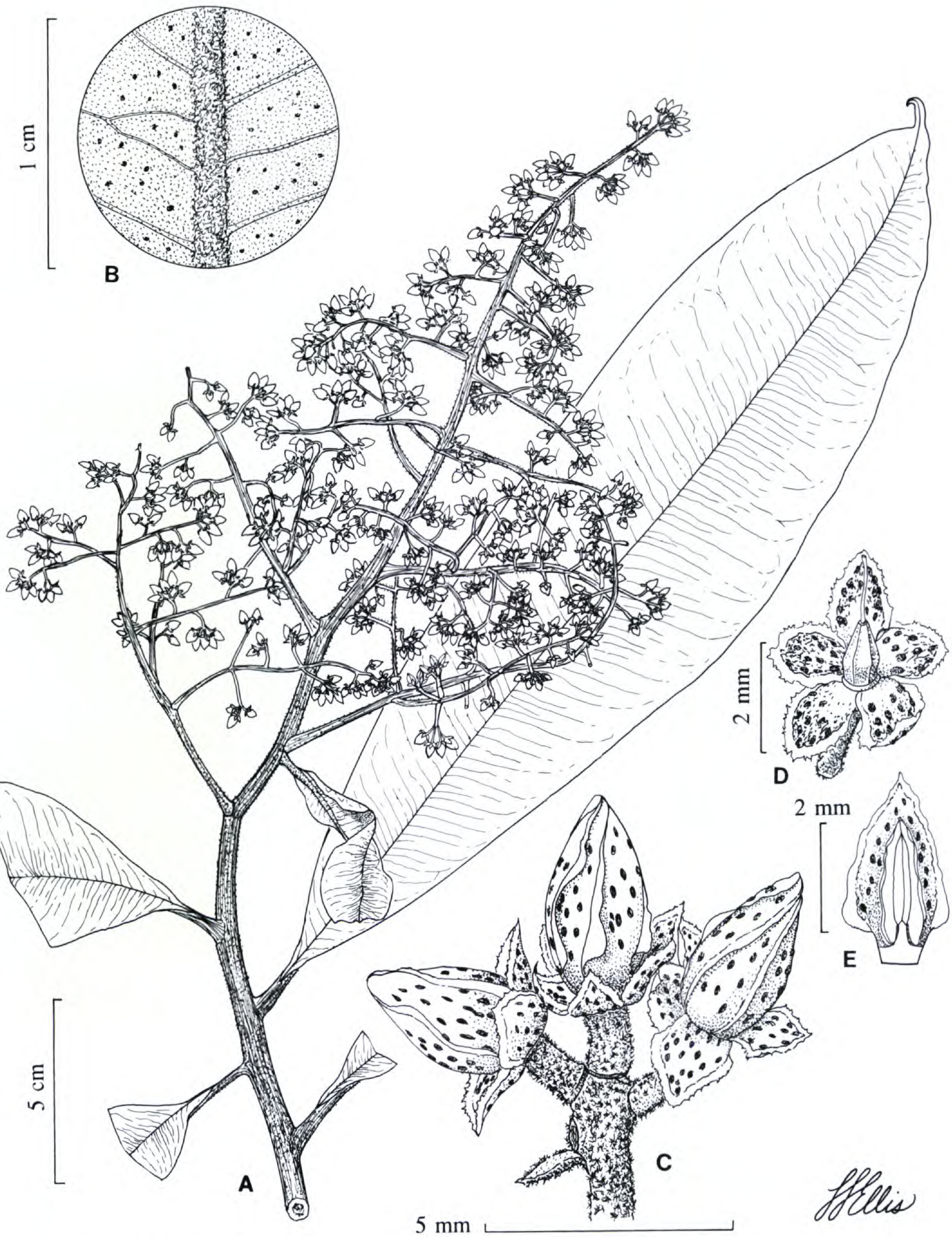

Figure 1. *Ardisia mcphersonii* Pipoly. —A. Flowering branchlet, showing straight inflorescence rachis. —B. Abaxial leaf surface, showing stellate tomentum of costa and furfuraceous lepidote surface of blade, with prominent black punctations. —C. Corymb, showing cylindrical pedicel and perianth punctation. —D. Open calyx and pistil (from bud), showing hyaline, erose, ciliate sepal margins. —E. Petal (from bud), showing asymmetry and punctation. A–E, drawn from the isotype.

long, 1–1.2 mm diam., densely and minutely red punctate, the style 2.1–2.3 mm long, epunctate, the stigma punctiform, the placenta globose, apiculate, the ovules minute, 24–35, pluriseriate. Fruit unkown.

Distribution and ecology. Known only from the type, growing in cloud forest, 1,875 m elevation.

Etymology. This species is dedicated to Gordon McPherson of the Missouri Botanical Garden, colleague and specialist in Madagascan Euphorbiaceae.

Ardisia mcphersonii, by its chartaceous, oblong to narrowly elliptic leaves with acuminate apices and acute bases, the tripinnately pyramidal-paniculate, terminal inflorescences, hyaline, erose and ciliate sepal margins, lanceoloid anthers, and, finally, the numerous, minute, pluriseriate ovules, is closely related to *Ardisia gentryi* Lundell, a species endemic to the Alto del Buey region of the central Colombian Chocó. However, *Ardisia mcphersonii* may be easily recognized by the straight primary inflorescence rachis, stellate tomentum, terete pedicels, and prominently black punctate upper leaf surfaces. Both species belong to the group of *Ardisia* species segregated into *Auriculardisia* Lundell (1981), defined by the furfuraceous lepidote scales, auriculate sepals, and minute, numerous ovules. However, because these features of *Auriculardisia* have now been found in Malesian *Ardisia*, subgenera *Acrardisia* Mez and *Tinopsis* Mez (Stone, 1989), use of these characters to segregate genera is precluded. Therefore, I am not recognizing the group as a separate genus, pending further studies.

Ardisia cardenasii Pipoly, sp. nov. TYPE: Colombia. Antioquia: Parque Nacional Natural "Las Orquídeas," Mcpio. Urrao, left bank of Río Venados, 6°34′N, 76°19′W, 1,110–1,240 m, 27 July 1988 (fl, fr), *A. Cogollo et al. 3522* (holotype, JAUM, No. 17907; isotypes, COL, FMB, JAUM, No. 17908, MO, NY, US). Figure 2.

Ob ramulos flexuosos, laminas desuper glabras atropunctatas secus margines planas, inflorescentiam rhachidi aliquantum flexuosa, flores corymbosos, pedicelos cylindricos sepala petalaque symmetrica, petala ad bases connata, antheras concoloras ad apices rotundatis vel truncatis primum poris apicalibus deinde rimis longitudinalibus deshiscentibus *A. standleyanae* P. H. Allen valde affinis, sed ab ea laminis membranaceis (non chartaceis) lanceolatis (nec ellipticis vel oblongis necque obovatis), desuper scrobiculatis (nec laevibus), ad bases rotundatis (nec acutis), petiolis canaliculatis (non marginatis), necnon petalis 5.5–6.3 (non 4.8–5.2) mm longis, connatis 1.2–1.4 (nec 0.5) mm longis, oblongis (nec ellipticis), secus margines hyalinis erosisque denique glabris (nec opacis integerrimis translucido-lepidotisque) denique filamentis glabris (non papillosis) praeclare distat.

Tree to 14 m tall, 15 cm DBH; branchlets terete, somewhat flexuous, 2–3 mm diam., the apical buds densely appressed ferrugineous furfuraceous-lepidote, glabrescent. Leaves membranaceous, the blades lanceolate, (6.7–)10.5–14.5 cm long, (2.8–)3.5–5.7 cm wide, apex long-acuminate, the acumen 1–2 cm long, base rounded, not decurrent on the petiole, costa slightly raised above, prominently raised below, secondary veins 20–35 pairs, slightly raised above and below, glabrous and somewhat nitid above, pallid, densely and prominently black punctate and sparsely furfuraceous lepidote below, glabrescent, the margin slightly irregular, flat, entire, glabrous; petiole canaliculate, 0.3–0.5(–0.7) cm long, glabrous above, sparsely furfuraceous-lepidote below, glabrescent. Inflorescence terminal, bipinnately pyramidal-paniculate, (6.5–)9.5–15 cm long, 6.5–10.5 cm wide at base, the raquis slightly flexuous, glabrous; inflorescence bract unknown; floral bracts membranaceous, ovate, 0.3–0.5 mm long, 0.2–0.3 mm wide, apex obtuse, hyaline, conspicuously black puncate, early caducous, the margin entire, hyaline, glabrous; pedicels cylindrical, 3–7 mm long, conspicuously red punctate, glabrous. Flowers corymbose, 5–6-merous, white; sepals free, chartaceous, ovate, 2–2.8 mm long, 1–1.2 mm wide, apex truncate to premorse, densely and prominently red punctate, the margin hyaline, erose, glabrous; corolla membranaceous, (5.5–)5.8–6.3 mm long, the tube barely developed, 1.2–1.4 mm long, the lobes oblong, 4.4–4.9 mm long, 2.4–2.6 mm wide, apex truncate to widely rounded, prominently black punctate and brown punctate-lineate, glabrous, the margin minutely crenulate, glabrous; stamens 4.6–5 mm long, the filaments free, flat, 2.8–3.2 mm long, basally expanded, inserted at petal base, glabrous, epunctate, the anthers basifixed, lanceoloid, 2.1–2.5 mm long, 0.7–0.9 mm wide, apex truncate, base deeply cordate, concolorous, dehiscent by subterminal pores, then opening by narrow longitudinal slits, the connective epunctate; pistil 6–6.5 mm long in anthesis, the ovary conical, 1.2–1.4 mm long and in diam., the style 4.8–5.1 mm long, the stigma punctiform, the placenta globose, apiculate, the ovules 22–32, pluriseriate. Fruit globose, 5–7 mm long and in diam., exocarp thin, densely and prominently black punctate.

Distribution and ecology. Ardisia cardenasii is known only from premontane rainforests of the western slopes of the Cordillera Occidental of Colombia, in the general area of Urrao, Antioquia, at 1,110–1,400 m elevation.

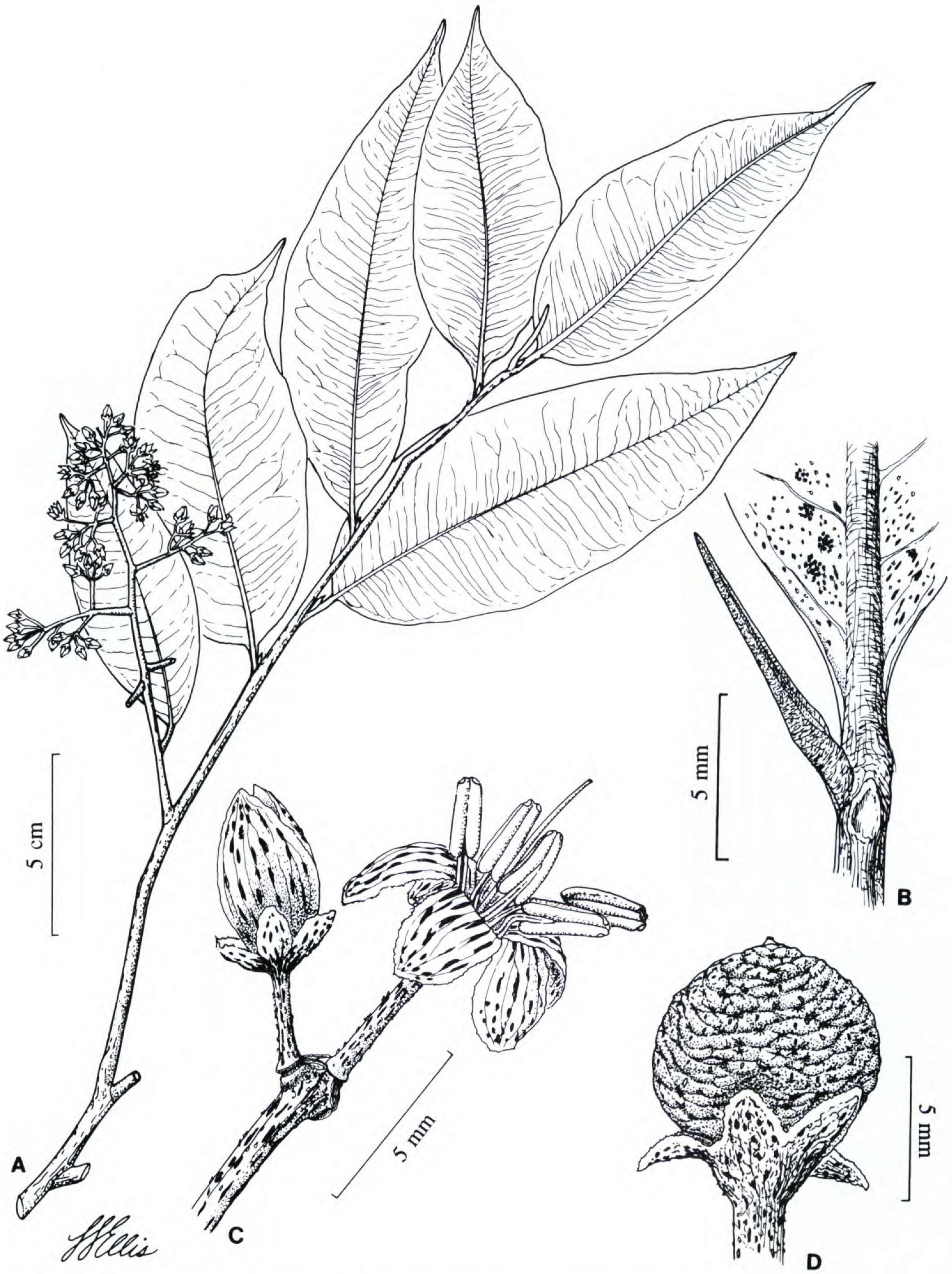

Figure 2. *Ardisia cardenasii* Pipoly. —A. Flowering branchlet, showing corymbose flowers of tripinnate panicle. —B. Abaxial leaf surface and branchlet, showing furfuraceous lepidote vestiture. —C. Corymb, showing cylindrical pedicels, and poricidally dehiscent anthers with truncate apices. —D. Fruit and calyx, showing hyaline, erose, glabrous margins. A–D, drawn from the holotype.

Etymology. This species is named in honor of Dayron Cárdenas López, curator of the herbarium at the Fundación Jardín Botánico, "Joaquín Antonio Uribe" (JAUM), Medellín, Colombia. Through his numerous collections, and their copious field data, our knowledge of the flora from the Cordillera Occidental (Antioquia and Chocó) has been greatly improved.

Common name. "Guayabillo."

Paratypes. COLOMBIA. **Antioquia:** Parque Nacional Natural "Las Orquídeas," Mcpio. Urrao, Camino de Venados toward Carauta, right bank of río Venados, 1,400 m, 06°33′N, 76°17′W, 15 Feb. 1989 (fl), *A. Cogollo et al. 4010* (COL, FMB, JAUM, MO, NY, US).

Ardisia cardenasii, by its somewhat flexuous branchlets, adaxially glabrous, black punctate leaves with entire, flat margins, inflorescences with somewhat flexuous primary rachis, flowers in corymbs, cylindrical pedicels, symmetric petals and sepals, petals basally short-connate, and finally, concolorous anthers dehiscent first by pores, then by longitudinal slits, is closely related to *Ardisia standleyana* P. H. Allen, which is a highly variable species occurring from Honduras to Venezuela. The membranaceous, lanceolate, scrobiculate leaf blades with rounded bases and canaliculate petioles, concomitant with the longer, oblong, apically premorse to truncate, more connate petals with hyaline, erose and glabrous margins, clearly separate *A. cardenasii* from *A. standleyi*.

Ardisia pluvialis Pipoly, sp. nov. TYPE: Ecuador. Esmeraldas: streambed, near Río Palaví, Awá encampment, 01°07′N, 78°37′W, 150–350 m, 10 Feb. 1988 (fl), *W. Hoover et al. 3747* (holotype, MO; isotypes, QCA, QCNE). Figure 3.

Species haec ob petiolos 5–9 mm longos, sepala anguste triangulares, 2–2.3 mm longa, necnon ad apices attentuatos *A. loretensis* valde affinis sed ab ea laminis 1.8–3 (non 3.5–6.5) cm latis, ad apices longi-attenuato-(nec abrupte-) acuminatis, acumine 1.5–2 (non 0.6–1) cm longo, inflorescentiis erectis (non pendulis) cum rhachidibus flexuosis vel geniculatis (nec rectis), pedicellis 4.9–5.5 (non 6–10) mm longis, denique fructibus verruculosis (non costatis) facile cognoscitur.

Shrub to tree to 2 m tall; branchlets terete, thin, 2–2.5 mm diam., densely rufous furfuraceous-lepidote, persistent. Leaves alternate, membranaceous, the blades narrowly elliptic to narrowly oblanceolate, (5.5–)8–10(–12) cm long, (1.8–)2–3 cm wide, apex long-acuminate, the acumen 1.5–2 cm, the base cuneate, decurrent on the petiole, glabrous, costa canaliculate, glabrous and epunctate above, prominently raised, densely furfuraceous-lepidote and black punctate-lineate below; smooth, somewhat nitid and sparsely black punctate above, furfuraceous-lepidote, densely and prominently black punctate below, the margin roughly serrate, flat, glabrous; petioles deeply canaliculate, 0.5–0.9 mm long, glabrous above, densely furfuraceous-lepidote below, persistent. Inflorescence terminal, columnar, pinnately paniculate, 7–11 cm long, 4.5–6 cm wide, the rachis flexuous to geniculate; peduncle 1–1.2 cm long; inflorescence bract foliaceous, with same form as leaves, but 4–6 cm long, 1.5–1.7 cm wide; inflorescence branch bracts similar to inflorescence bract, but progressively smaller acropetally; second-order branch bracts membranaceous, linear, progressively smaller acropetally, 1.8–2.2 mm long, ca. 0.3 mm wide, apex attenuate, densely and prominently black punctate and punctate-lineate, densely furfuraceous-lepidote, the margin entire, densely lepidote; floral bracts chartaceous, linear-lanceolate, 0.7–1.1 mm long, 0.2–0.4 mm wide, apex acute, the margin hyaline, erose and glandular-ciliate; pedicel cylindrical, 4.9–5.5 mm long, 0.5 mm diam, densely and prominently black punctate and furfuraceous-lepidote. Flowers corymbose, 5-merous; white; sepals free, chartaceous, narrowly triangular, 2.1–2.3 mm long, 0.7–0.9 mm wide, apex attenuate, densely and prominently black punctate and punctate-lineate, the margin hyaline, regular, erose apically, long glandular-ciliate; corolla membranaceous, 3.8–4.2 mm long, the petals short-connate, the tube 1.2–1.4 mm long, the lobes oblong, 2.4–2.6 mm long, 1.1–1.4 mm wide, apex acuminate, asymmetric, hyaline, sparsely and prominently black punctate-lineate medially, glabrous, the margin hyaline, entire, glabrous; stamens 3.1–3.5 mm long; the filaments flat, 2.1–2.3 mm long, inserted at petal base, expanded basally, glabrous, epunctate, the anthers lanceolate, basifixed, 1.4–1.8 mm long, 0.5–0.7 mm wide, apex cuspidate, base sagittate, dehiscent by subterminal pores, then by wide longitudinal slits, the connective darkened dorsally, glabrous; pistil obturbinate, 4.4–4.6 mm long in anthesis, the ovary subglobose, 1–1.2 mm long, 0.8–1 mm diam., verrucose, densely and prominently red punctate, the style 3.5–3.8 mm long, epunctate, the stigma punctiform, the placenta globose, apiculate, the ovules 4–6, pluriseriate. Fruit globose, 3–5 mm long and diam., exocarp thin, densely and prominently black punctate.

Distribution and ecology. *Ardisia pluvialis* is endemic to pluvial forests along the río Palawi, of northwesternmost Ecuador, a part of the Chocó Floristic Province (Gentry, 1982), at 150–250 m el-

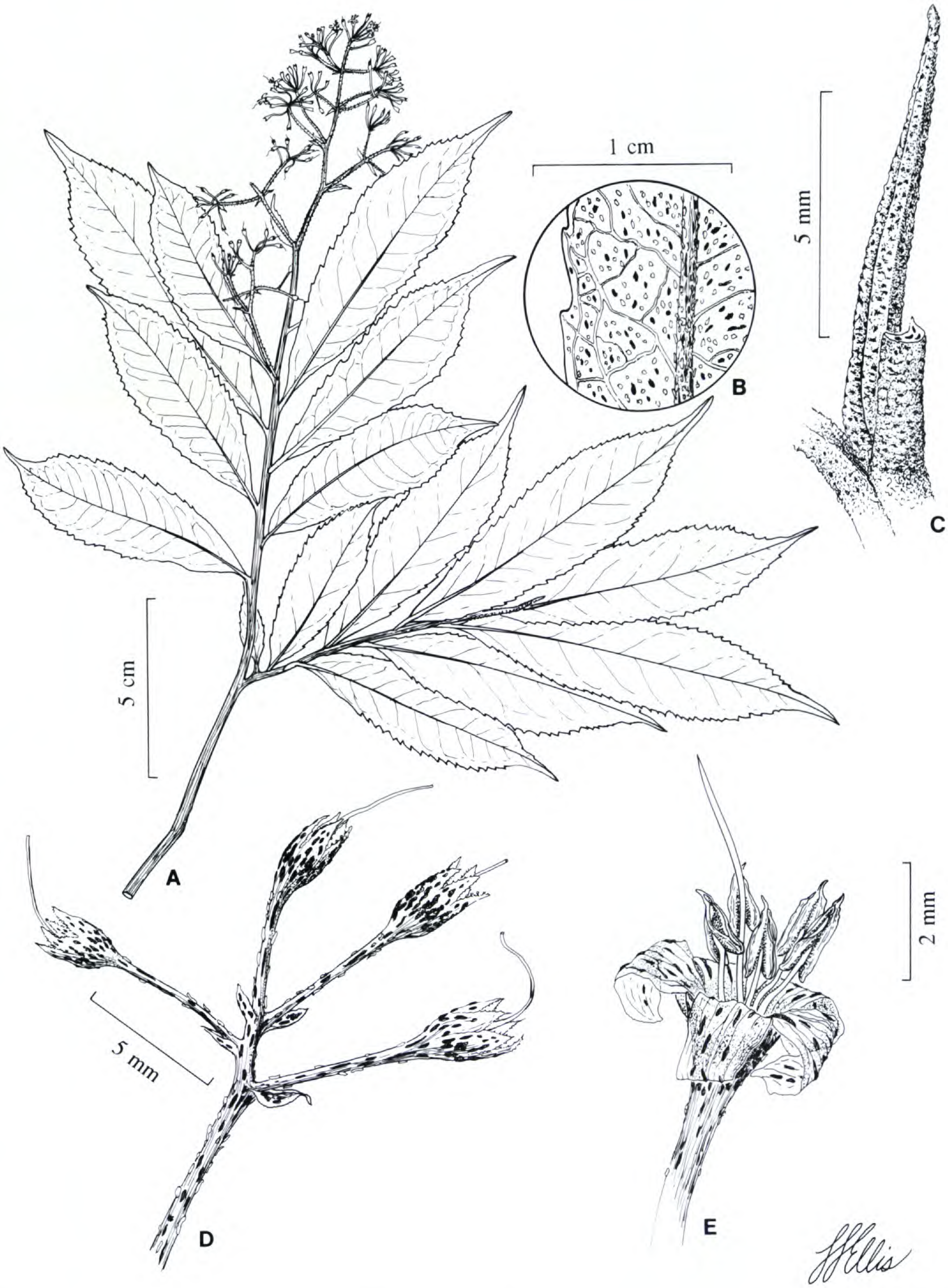

Figure 3. *Ardisia pluvialis* Pipoly. —A. Flowering branchlet, showing scaly inflorescence rachis tomentum and corymbose flowers. —B. Abaxial leaf surface, showing furfuraceous lepidote scales, prominent punctations and roughly serrate margin. —C. Terminal bud, showing furfuraceous lepidote indumentum. —D. Corymb, showing large scales, prominently raised punctations and sepals with erose margins apically. —E. Flower at anthesis, showing cuspidate anthers. A–E, drawn from the holotype.

evation. It grows as a small shrub between rocks at river edges.

Etymology. The specific epithet "pluvialis" refers to rain and by inference suggests the rainforests below the Andean cordillera in which the species occurs.

Paratypes. ECUADOR. **Esmeraldas:** streambed, near Río Palawí, Awá encampment, 0°58′N, 78°16′W, 200 m, 10 Feb. 1988 (fr), *W. Hoover et al. 3105* (MO, QCA); creek on left bank of río Palaví, going upriver, 2 bends from Awá encampment, 01°07′N, 78°37′W, 225 m, 13 Feb. 1988 (fr), *W. Hoover et al. 3188* (QCA, MO); Río Palawí near Awá encampment, 150–200 m, 9 Feb. 1988 (fl), *W. Hoover et al. 3805* (QCA, MO); down Río Palawí 1 km from Awá camp, 150–250 m, 12 Feb. 1988 (fl), *W. Hoover et al. 4119* (QCA, MO).

Ardisia pluvialis, its sister species, *A. novitensis* Lundell, and *A. loretensis* Lundell are very closely related. They share such characters as the membranaceous leaves with dentate or serrate margins, the short petioles, terminal panicles with slender rachises and pedicels, furfuraceous indument of stalked scales on the branchlets, inflorescence rachises and abaxial leaf surfaces, and the hyaline-marginate sepals. *Ardisia novitensis* was thought to be endemic to southern Chocó, but it has now been discovered recently at Murrí (Antioquia), adjoining the Parque Nacional "Las Orquídeas" (*Callejas et al. 6741*). *Ardisia loretensis*, previously known from Amazonas and Loreto, Peru, has now been collected from Napo, Ecuador, in the Yasuní National Park and the Jatún Sacha Biological Station (*Cerón 3612, 3948*).

These three closely related species may be separated using the following key:

1a. Petioles 5–9 mm long; sepals narrowly triangular, 2–2.3 mm long, apex attenuate; plants of lowland forests, less than 500 m elevation.
  2a. Leaf blades (1.8–)2–3 cm wide, apex long acuminate-attenuate, the acumen 1.5–2 cm long, the margin serrate; inflorescence erect, the rachis flexuous to geniculate; pedicels 4.9–5.5 mm long; fruit verrucose; lowland riparian forest of NW Ecuador, below W slopes of Western Andean Cordillera, 100 to 250 m elevation .... *A. pluvialis*

2b. Leaf blades 3.5–6.5 cm wide, apex abruptly acuminate, the acumen 0.6–1 cm long, the margin dentate; inflorescence pendent, the rachis straight; pedicels 6–10 mm long; fruit longitudinally costate; Amazonian Peru and Ecuador, 100–450 m elevation .... *A. loretensis*

1b. Petioles 3–5 mm long; sepals ovate-triangular, 1–1.2 mm long, apex acute; premontane forests of Chocó Floristic Province, 500–900 m elevation ..... *A. novitensis*

Both *Ardisia loretensis* and *A. novitensis* were transferred to *Icacorea* Aublet by Lundell (1981) because of the furfuraceous lepidote indumentum of the branchlets and linear or lanceolate, concolorous, and poricidally dehiscent anthers. However, because there is no unique feature that defines *Icacorea*, I choose to recognize it as an infrageneric group rather than a distinct genus, pending further study.

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Literature Cited

Cuatrecasas, J. 1958. Aspectos de la vegetación natural de Colombia. Rev. Acad. Ci. Exact 10: 221–668.

Forero, E. 1982. La flora y la vegetación del Chocó y sus relaciones fitogeográficas. Colombia Geográfica 10: 77–90.

———. 1988. Botanical exploration and phytogeography of Colombia: Past, present and future. Taxon 37: 561–566.

———. 1989. Colombia. *In:* D. G. Campbell & H. D. Hammond (editors), Floristic Inventory of Tropical Countries. New York Botanical Garden, New York.

Gentry, A. 1982. Phytogeographic patterns as evidence for a Chocó Refuge. Pp. 112–126 *in* G. T. Prance (editor), Biological Diversification in the Tropics. Columbia Univ. Press, New York.

Lundell, C. L. 1981. Neotropical Myrsinaceae—VI. Phytologia 49: 341–354.

Stone, B. C. 1982. New and noteworthy Malaysian Myrsinaceae, I. Malaysian Forester 45: 101–121.

A New Combination in *Hyptis* (Lamiaceae)

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ABSTRACT. The new combination *Hyptis conferta* var. *angustata* (Briquet) A. Pool & Harley is made to replace the invalid *Hyptis conferta* var. *angustifolia* Bentham.

The name *Hyptis conferta* var. *angustifolia* Bentham has been widely used in publications and in specimen identification. However, in the process of preparing the Lamiaceae for the *Flora de Nicaragua*, Pool noticed that the original Bentham publication (Bentham, 1848: 112) had neither description nor diagnosis and was therefore invalidly published. The earliest valid name for this taxon at the varietal rank is *Hyptis jurgensenii* var. *angustata* Briquet, and a new combination based on this name is made here.

When Epling validated Bentham's name by furnishing it with a description, he placed in synonymy: *Hyptis jurgensenii* var. *angustata* Briquet (mistakenly referring to it as *H. jurgensenii* var. *angustifolia*) (Epling, 1933). By including the earlier Briquet name in synonymy, Epling made the new name *H. conferta* var. *angustifolia* Bentham ex Epling superfluous and illegitimate.

Hyptis conferta var. **angustata** (Briquet) A. Pool & Harley, comb. nov. Basionym: *Hyptis jurgensenii* var. *angustata* Briquet, Annuaire Conserv. Jard. Bot. Genève 2: 220. 1898. TYPE: Mexico. Oaxaca: 3,000 ft., *Galeotti 717* (G).

Hyptis ferruginea Bentham, Labiat. Gen. Spec. 113. 1833. TYPE: "Nova Hispania," *Moçiño & Sessé s.n.* (holotype, OXF).

Hyptis excelsa M. Martens & Galeotti, Bull. Acad. Roy. Sci. Bruxelles 11(2): 188. 1844. TYPE: Mexico. Mirador: 3,000 ft., *Galeotti 624* (holotype, BR not seen; isotypes, K, G photo seen).

Hyptis lundii Bentham, in DC. Prodr. 12: 111. 1848. TYPE: Brazil. São Paulo: prope Batates, *Lund s.n.* (holotype, G-DC microfiche seen; isotype, C photo seen).

Hyptis constricta Briquet, Annuaire Conserv. Jard. Bot. Genève 2: 217. 1898. TYPE: Costa Rica. Terraba: 260 m, *Pittier & Durand 3719* (holotype, BR not seen).

Hyptis jurgensenii Briquet, Annuaire Conserv. Jard. Bot. Genève 2: 219. 1898. TYPE: Mexico. Sierra San Pedro Nolasco, *Jurgensen 723* (holotype, G).

Hyptis conferta var. *angustifolia* Bentham ex Epling, nom. illeg. Repert. Spec. Nov. Regni Veg. 34: 124. 1933. TYPE: Brazil. Prov. Piauhy in Serra do Batalha, *Gardner 2933* (lectotype, K; isolectotypes, GH not seen, W).

Hyptis belizensis Lundell, Contr. Univ. Michigan Herb. 8: 83. 1942. TYPE: Belize. Toledo District: Swasey Branch, Monkey River, *Gentle 2896* (holotype, MICH not seen; isotypes, MO, NY).

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Literature Cited

Bentham, G. 1848. Labiatae. *In:* A. P. de Candolle, Prodromus 12: 27–603. Paris.

Epling, C. 1933. Synopsis of the genus *Hyptis* in North America. Repert. Spec. Nov. Regni Veg. 34: 73–130.

A New Species and New Combinations of Boraginaceae from China

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ABSTRACT. *Cynoglossum macrocalycinum* from Xinjiang, China, is described as new, and its distinguishing characters from the other species of the genus are given. The new combinations *C. furcatum* var. *villosulum* and *Hackelia differmis* are proposed.

Cynoglossum officinale L., a species widespread in Europe and western Asia, was reported for China by various workers, including Liu (1989). Liu's description of the species indicated that a different species, though superficially resembling *C. officinale*, is involved. A specimen identified under this name was loaned from Jiangsu Institute of Botany (NAS) during the revision of Boraginaceae for the *Flora of China*. The specimen is herein described as a new species.

Cynoglossum macrocalycinum Riedl, sp. nov. TYPE: China. Sinkiang [Xinjiang], Shawan County, Ziniquan, Ning jiahe, hill slope, 1,750 m, *T. Zhou s.n.* (holotype, NAS).

Species nova imprimis foliis caulinis maximis, mediis et superioribus tantum notis 13–14 cm longis, 3–3.5 cm latis, pedicellis sub anthesi 1 cm, postea usque ad 3 cm longis, calycibus floriferis 8–9 mm longis, laciniis fere ad basin liberis, marginibus sese tegentibus, ovatis vel ovato-oblongis, obtusissimis, subpatule dense albo-pilosis imprimis, post florendum ad 10–12 mm elongatis, latitudine inaequalibus lobo latissimo usque ad 5 mm lato, angustissimo, quam omnes ceteri multo angustiore, 2.5 mm lato, corolla campanulata, calycem paulo tantum superante, 9–9.5 mm lata, obscure reticulato-venosa, fornicibus magnis subquadratis quam antherae multo majoribus insignis.

Herbs stout, at least 50–60 cm high, lower parts missing. Stem with few branches in leaf axils, densely covered with white patent or slightly reflexed hairs. Upper middle leaves oblong-lanceolate, 13–14 cm long, 3–3.5 cm wide, sessile, base attenuate, apex subacute; uppermost leaves ovate- to oblong-lanceolate, 5.5–11 cm long, 2–3 cm wide, base often abruptly contracted or rounded, apex acute to subobtuse; leaves of lateral branches lanceolate to linear-lanceolate, (3–)6–9 cm long, 0.8–1.8 cm wide, lowermost indistinctly petiolate; leaf indumentum of ± patent, curved hairs of different length. Cymes short, loose at last, without bracts. Pedicel ca. 1 cm at flowering, to 3 cm in fruit, densely covered with white hairs, straight at first, little recurved later along upper third. Calyx 8–9 mm long in flower, sepals free to base, imbricately covering each other along margins, ovate to ovate-oblong, broadly obtuse, elongated to 10–12 mm after flowering, unequal in width, widest to 5 mm, narrowest ca. 2.5 mm, often also shorter than others, all subexplanate, densely covered with patent white hairs. Corolla campanulate, to 1 mm longer than calyx, 9–9.5 mm wide, dark purple, with reticulate veins; tube ca. 5 mm long, equaling limb; lobes to 2 mm long, very broadly rounded. Faucal appendages large, subquadrate, much bigger than anthers. Ovary remaining very small well after anthesis. Style short, included in corolla. Mature nutlets not seen.

Due to the lack of mature nutlets, the exact relationships of *Cynoglossum macrocalycinum* cannot be established. It is readily distinguished from *C. officinale* and the other Chinese species by large calyces strongly accrescent after flowering, broadly obtuse unequal calyx lobes with overlapping margins, distinctly veined corollas only slightly longer than calyx, and nutlets attaining their full size very late. This combination of characters is unique in the genus. The corolla venation of *C. macrocalycinum* resembles that of *C. creticum* Miller, but the latter species has a smaller (3–5 mm long) flowering calyx that becomes reflexed in fruit and with equal oblong lobes. In addition to *C. macrocalycinum*, there are two other species of *Cynoglossum* from Xinjiang, *C. divaricatum* Stephan and *C. viridiflorum* Pallas ex Lehmann, both belonging to subgenus *Cynoglossum*. It is most likely that the new species also belongs to this group.

Cynoglossum furcatum Wallich ex Roxburgh var. **villosulum** (Nakai) Riedl, comb. et stat. nov. Basionym: *Cynoglossum villosulum* Nakai, Bot. Mag. (Tokyo) 37: 6. 1923. TYPE: not designated.

The inflorescence in variety *villosulum* is less branched and more elongated than in the type variety, the leaves are short pubescent and usually

also larger, and the glochids are less abundant on the dorsal surface of the nutlets.

Cynoglossum furcatum is the correct name for what has been erroneously called *C. zeylanicum* by various authors who followed Brand (1921). True *C. zeylanicum* (Vahl) Thunberg has one or few, terminal, elongated, upright branches of the inflorescence, instead of many divaricate branches. In this respect it is more similar to variety *villosulum*, but the leaf hairs are shorter and more rough, and the plant and leaves are usually much smaller. *Cynoglossum javanicum* Thunberg is probably conspecific with *C. zeylanicum*, and the species does not grow north of Sri Lanka. The case will be dealt with at more length in connection with a revision of *Cynoglossum* subg. *Paracynoglossum* now in progress.

Hackelia difformis (Y. S. Lian & J. Q. Wang) Riedl, comb. nov. Basionym: *Eritrichium difforme* Y. S. Lian & C. Q. Wang, Acta Phytotax. Sin. 18: 515. 1980. TYPE: China. Sichuan: Leibo, *T. T. Yü 3842* (holotype, HP).

Lian & Wang (1980, 1989) argued that there are not sufficient differences between *Eritrichium* and *Hackelia* to keep the latter as a separate genus. However, the most important character separating the two, shape of the gynobase, was not mentioned in their argument. The gynobase in *Eritrichium* is cushion-shaped and 1 mm high at best, whereas in *Hackelia* it is distinctly conical and 2–3 mm high. Furthermore, *Hackelia* species are taller as a rule, many have basal leaves with cordate to truncate base, and all have deflexed fruiting pedicels, though such pedicels are found in some species of *Eritrichium*. The marginal prickles of nutlets are less reliable in differentiating between the two genera. In *Hackelia* they always are anchorlike at the apex, but in *Eritrichium* they may be acute or even broadly obtuse and flat as a whole, and only sometimes are they mixed with glochids. *Hackelia difformis* is a typical representative of the genus, and it bears close resemblance to many Pacific American species, where *Hackelia* is centered. In my opinion, the two genera represent different evolutionary lines. It is very likely that other species listed under *Eritrichium* from China will have to be transferred to *Hackelia* in the future.

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Literature Cited

Brand, A. 1921. Borraginaceae–Borraginoideae–Cynoglosseae. *In:* A. Engler (editor), Das Pflanzenreich IV. 252.

Lian, Y. S. & J. Q. Wang. 1989. *Eritrichium. In:* X. W. Kung & W. T. Wang (editors), Fl. Reipubl. Popularis Sin. 64(2): 116–151.

———, ——— & W. T. Wang. 1980. New Taxa of Boraginaceae from Xizang (Tibet). Acta Phytotax. Sin. 18: 514–520.

Liu, Y. L. 1989. *Cynoglossum. In:* X. W. Kung & W. T. Wang (editors), Fl. Reipubl. Popularis Sin. 64(2): 220–229.

Jessea and *Talamancalia*, Two New Genera of the Senecioneae (Asteraceae) from Costa Rica and Panama

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ABSTRACT. Two new genera from Costa Rica and Panama, *Jessea* and *Talamancalia*, are described. Both genera have elongate corolla lobes, styles with paired stigmatic lines and narrowly rounded penicillate-haired tips, small papillose cells on the achene surface, and neither has tails on the anthers. *Jessea* has a spiciferous receptacle and carpopodia with many rows of cells. *Jessea* includes *Senecio cooperi*, *S. megaphyllus*, and *S. multivenius*, with the last as type; the appropriate new combinations are made herein. *Talamancalia* has mucilage hairs on the achene and carpopodia nearly obsolete. The genus includes *Talamancalia boquetensis* (Standley) H. Robinson & J. Cuatrecasas and the new species, *T. westonii*, with the latter as type.

Two new genera are established for species of Senecioneae from Panama and Costa Rica that have some of the general appearance of true *Senecio* L., and have some aspects of *Pseudogynoxys* (Greenman) Cabrera and *Jacmaia* B. Nordenstam, but differ in details of the style tips, stigmatic surfaces, corolla lobes, and the setulae of the achene. The first genus, *Jessea*, includes *Senecio multivenius* and two other species that in some characters resemble the genus *Jacmaia* of Nordenstam. The other genus, *Talamancalia*, includes *Senecio boquetensis* Standley and a second species, *Talamancalia westonii*, which is described here as new.

Senecio multivenius Bentham ex Oersted of Costa Rica was described almost 150 years ago, and is the best known of the series of superficially similar, but poorly understood species in southern Central America. The group includes the more recently described and closely related *S. cooperi* Greenman and *S. megaphyllus* Greenman. The superficially similar *Senecio boquetensis* was described about 50 years ago from the province of Chiriquí in Panama. All the species mentioned have elongate corolla lobes, style tips rather rounded and bearing an apical pencil of hairs, and small papillose cells on the surface of the achene. In contrast, *Senecio* sensu stricto has short corolla lobes, truncate style tips without apical hairs, and usually narrow smooth cells on the surface of the achene. The species all require transfer from *Senecio* sensu stricto to other genera.

The first of the Central American species listed above to be removed from *Senecio* was the Panamanian endemic *S. boquetensis*, one of two species transferred by Turner (1991) to the widely distributed neotropical genus *Pseudogynoxys* (Greenman) Cabrera. The position of the species in *Pseudogynoxys* was accepted by Jeffrey (1992). Jeffrey (1992) also transferred the Costa Rican *S. cooperi*, *S. megaphyllus*, and *S. multivenius* to the previously exclusively Jamaican genus *Jacmaia* of Nordenstam (1978). The latter transfer reflected a similarity in habit and the presence of subulate processes in the receptacle in *Jacmaia* and the *S. multivenius* group. Of these treatments, the present study accepts the conclusion by Jeffrey that the primarily Costa Rican *S. multivenius* group and the Panamanian *S. boquetensis* are not directly related to each other. However, the present study rejects Jeffrey's (1992) placement of the *S. multivenius* group in *Jacmaia* and rejects Turner's (1991) and Jeffrey's (1992) placement of *S. boquetensis* in *Pseudogynoxys*. Both elements are named here as new genera.

The Central American species listed above all fall among the senecionoid genera of the tribe Senecioneae in the list by Jeffrey (1992) although they are placed in different subgroups. *Jacmaia*, including the *S. multivenius* series, is placed by Jeffrey in his Neotropical Group, with mostly woody genera such as *Pentacalia*. Jeffrey's *Jacmaia* sensu lato is described as having scalelike processes on the receptacle, style-arms appendaged, a massive carpopodium with 10–12 or more rows of cells, and leaves pinnately lobed. *Pseudogynoxys*, with *S. boquetensis*, is placed by Jeffrey in his senecionoid group closer to *Erechtites* Rafinesque and *Emilia* (Cassini) Cassini and *Senecio* L. sensu stricto. Jeffrey states that the styles have trullate appendages, the carpopodia are obscure, and the genus does not have processes on the receptacle.

Some of the differences between *Jacmaia* and *Pseudogynoxys* noted by Jeffrey (1992) are retained here to distinguish the two new genera, but

the new genera are not considered as distant from each other in relationship as suggested by Jeffrey, and they do not belong to the genera in which they are placed by Turner (1991) and Jeffrey (1992). The *Senecio multivenius* group differs from *Jacmaia* by three striking features. The style appendage in the Jamaican type species of *Jacmaia*, *J. incana* (Swartz) B. Nordenstam, is sharply acute, the stigmatic surface is continuous over the inner surface of each branch, and anther bases have long tails. The style tip of the *S. multivenius* group is rounded and ends in a pencil of long hairs, the style branch has separated paired stigmatic lines, and the anthers have no tails. In *Jacmaia* the continuous stigmatic surface is correlated with a greatly enlarged resin duct in the style branch. The style branches of the *S. multivenius* group and *S. boquetensis* have only a slender duct. The *S. multivenius* group is here named as a new genus, *Jessea*, in honor of the well-known authority in the Senecioneae, Jesse M. Greenman (1867–1951).

The comparative similarity of *Senecio boquetensis* to *Pseudogynoxys* is not considered sufficient to include the species in that genus. The Panamanian endemic and the related undescribed Costa Rican species are erect herbs or subshrubs, while species of *Pseudogynoxys* are scrambling subshrubs or vines. The difference in habit from *Pseudogynoxys* is particularly marked in the previously undescribed shrubby Costa Rican relative of *S. boquetensis*. The leaves of the new genus are deeply, pinnately lobed at the base of the blade, while those of *Pseudogynoxys* are unlobed. The leaf bases have stipulelike continuations of the petiolar wing that clasp the stem, but isolated stipulelike lobes at the bases of unwinged petioles are found in only a few species of *Pseudogynoxys* (Robinson & Cuatrecasas, 1977). An additional useful feature of the new genus is the fattened and often obviously mucilaginous setulae on the achene wall. The setulae of *Pseudogynoxys* are smaller and not mucilaginous. The tips of the styles of the new genus are narrowly rounded with an abruptly delimited apical penicillate tuft of hairs, while the style tips of *Pseudogynoxys* are distinctly pointed and hairs are often continuous along the margins of the tapering tip. The anther appendages of the new genus have thicker-walled inner cells and a channeled center, but the appendages of *Pseudogynoxys* have more uniformly thickened cells throughout with no central channel. The new genus, with two species, is here named *Talamancalia* after the Talamanca Mountains of Costa Rica and Panama where it occurs.

A comparison of the two new genera shows that in addition to having an armed receptacle and a carpopodium with many rows of cells, *Jessea* differs from *Talamancalia* by having the narrow heads clustered in dense corymbiform cymes, in having only eight involucral bracts in each head, and in the less complex and less polarized thickenings of its median endothecial cells.

One additional element of interest in the *Jessea* and *Talamancalia* relationship is the second species transferred to *Pseudogynoxys* by Turner (1991), *Senecio telembinus* Cuatrecasas of the Río Maldonado on the border of Ecuador and Colombia. The South American species is like *S. boquetensis* in superficial aspect, having similar enlarged leaf bases, and close-set, ascending secondary veins. The Maldonado species differs from the Panama species, and from much of *Senecio* sensu stricto, by the lack of lobes on the leaves, by the lack of setulae on the achenes, by the presence of only eight ribs in the achene, and by the short-triangular style tip with a long apical pencil of hairs and strong subapical fringe. The South American species has no woolly pubescence. The species differs more importantly from all the discussed elements by the base of the leaf forming a sheath completely surrounding the stem. The Maldonado species was the basis of a separate genus, *Garcibarrigoa*, by Cuatrecasas (1986). In spite of the differences, it seems likely that *Garcibarrigoa* is a rather close relative of *Talamancalia*.

The five genera, *Garcibarrigoa*, *Jacmaia*, *Jessea*, *Pseudogynoxys*, and *Talamancalia*, differ from almost all species of *Senecio* sensu stricto by having long and narrow lobes on the corolla. The lobes in *Jacmaia* and all of *Jessea* except the type species are about as long as the throat. The limbs and the lobes of the corolla of *Garcibarrigoa* are comparatively short with the lobes narrowly triangular rather than narrowly oblong.

The new genus *Jessea* is characterized as follows:

Jessea H. Robinson & J. Cuatrecasas, gen. nov. TYPE: *Jessea multivenia* (Bentham ex Oersted) H. Robinson & J. Cuatrecasas.

In receptaculis armatis *Jacmaiae* similis sed in apicibus stylorum rotundatis et penicillate pilosis in lineis stigmataceis binis et in thecis antherarum base non caudatis differt.

Erect, coarse subshrubs to 5 m tall, sparingly branched; stems, leaves, and inflorescence minutely puberulous to subglabrous; stems often deflected at nodes, with longer internodes above, with solid pith. Leaves alternate, with base clasping but not completely surrounding stem; petioles distinctly winged to partially unwinged; blade narrowly ovate to elliptical, usually pinnately lobed near base, serrate above,

apex acute, secondary veins closely pinnate, widely spreading at 80–90°. Inflorescence terminal, with ascending branches, bearing numerous heads in dense corymbiform cymes; peduncles slender, minutely puberulous. Heads heterogamous, radiate, narrowly campanulate, with ca. 6 filiform calycular bracts in 1–2 series, involucral bracts usually 8, subequal; receptacle with scalelike processes. Ray florets 3–8; corollas yellow, glabrous, limbs with oblong cells above, not papillose. Disk florets 8–18; corollas yellow, glabrous, basal tube narrow, elongate, lobes narrowly triangular to linear, ½–3 times as long as throat, with weak resin ducts along margins and sometimes in center; anther collars with basal cells inflated; thecae with rounded bases, median endothecial cells with numerous thickenings on vertical walls, with few small thickenings on transverse walls; apical appendage oblong, with central channel inside, slightly concave outside, cells elongate, with thickened walls except at appendage margin; style base with distinct node; style shaft with 2 weak resin ducts outside of veins; style branches with separate paired stigmatic lines, a single central resin duct, short apical appendage prominently rounded with basal fringe of hairs, and isolated long apical tuft. Achenes cylindrical with 8 ribs, with short and mamillose surface cells, setulae slender and narrowly pointed or lacking; raphids seen only in ovule, oblong; carpopodium annuliform with 4–12 series of sclerified cells; pappus with slender easily deciduous bristles in ca. 3 series, without broadened tips. Pollen grains 30–40 μm diam.

The genus contains three species.

KEY TO THE SPECIES OF *JESSEA*

1a. Achenes covered with slender setulae .. *J. cooperi*
1b. Achenes glabrous.
  2a. Petiole at least partially unwinged; lobes of disk corolla distinctly shorter than corolla throat ..... *J. multivenia*
  2b. Petiole winged throughout; lobes of disk corolla about as long as the throat ..... *J. megaphylla*

Jessea cooperi (Greenman) H. Robinson & J. Cuatrecasas, comb. nov. Basionym: *Senecio cooperi* Greenman, Publ. Field Columbian Mus., Bot. Ser. 2: 284. 1907. *Jacmaia cooperi* (Greenman) Jeffrey, Kew Bull. 47: 63. 1992.

Distribution. Costa Rica, Panama.

Jessea megaphylla (Greenman) H. Robinson & J. Cuatrecasas, comb. nov. Basionym: *Senecio megaphyllus* Greenman, Publ. Field Columbian Mus., Bot. Ser. 2: 284. 1907. *Jacmaia megaphylla* (Greenman) Jeffrey, Kew Bull. 47: 63. 1992.

Distribution. Costa Rica, Panama.

Jessea multivenia (Bentham ex Oersted) H. Robinson & J. Cuatrecasas, comb. nov. Basionym: *Senecio multivenius* Bentham ex Oersted, Vidensk. Meddel. Dansk. Naturalist. Føren., Kjøbenhavn 1852: 109. 1853. *Jacmaia multivenia* (Bentham ex Oersted) Jeffrey, Kew Bull. 47: 63. 1992.

Distribution. Costa Rica.

The new genus *Talamancalia* is characterized as follows:

Talamancalia H. Robinson & J. Cuatrecasas, gen. nov. TYPE: *Talamancalia westonii* H. Robinson & J. Cuatrecasas.

Pseudogynoxys similis sed in habitu non volubilis in foliis lobatis et base anguste alatis et amplexicaulis in apicibus stylorum rotundatis penicillate pilosulis et in setulis acheniarum mucilagineis differt.

Erect or spreading subshrubs or shrubs to 2 m tall, unbranched or branching from near base; stems with short internodes and slightly deflected nodes below, with longer internodes above, hirsute to lanuginose, glabrescent with age, partially fistulose or with solid pith. Leaves alternate, with base clasping but not completely surrounding the stem; petioles scarcely to distinctly winged below lowest lobes; blade ovate to ovate-lanceolate, pinnately lobed mostly near base, serrate above, apex acute to acuminate, surfaces pilose to lanuginose, lower surface paler, secondary veins closely pinnate, somewhat to strongly ascending. Inflorescence terminal, in loose, elongate, rounded cyme, with ascending branches or with few heads on short branches; branches subglabrous to lanuginose. Heads heterogamous, radiate, broadly campanulate, with numerous filiform to broadly ovate calycular bracts in 2–3 series, involucral bracts 15–20, subequal; receptacle nonfistulose, without pales or spines. Ray florets 8–15; corollas orange, glabrous, limbs with short-oblong cells above, not papillose. Disk florets 20–90; corollas orange, glabrous, basal tube narrow, lobes narrowly oblong, slightly longer than throat, with resin ducts central and marginal; anther collars with basal cells inflated; thecae with rounded bases, inner median endothecial cells elongate with thickenings along vertical walls, outer median endothecial cells elongate with single thickenings on transverse walls; apical appendage oblong-ovate, with central chan-

Figure 1. *Talamancalia westonii* H. Robinson & Cuatrecasas, living plant. Photo by Weston.

nel, channel sometimes reddish, cells elongate, with thickened walls except at appendage margin; style base with distinct node; style shaft with 2 resin ducts outside of veins; style branches with separate paired stigmatic lines, a single central resin duct, short appendage prominently rounded with basal fringe of hairs and isolated short apical tuft. Achenes cylindrical with 10 ribs, with short and mamillose surface cells, setulae short and somewhat broadened, sometimes obviously mucilaginous; raphids seen only in ovule, oblong; carpopodium obsolete with a sometimes incomplete single series of sclerified cells; pappus with slender easily deciduous bristles in ca. 4 series, without broadened tips. Pollen grains ca. 37 μm diam.

The genus contains two species.

KEY TO THE SPECIES OF *TALAMANCALIA*

1a. Heads 8–15 in each corymbiform cyme, ca. 1.0–1.3 cm high, with numerous filiform calycular bracts at base; leaves lobed only below basal fifth of blade, scarcely or thinly lanuginose on lower surface; secondary veins 1.5–4.0 cm long, mostly parallel and close nearly to margin, ascending at ca. 45°; limbs of rays with ca. 8 longitudinal veins ..... *T. boquetensis*

1b. Heads 2–4, ca. 2 cm high, with large ovate calycular bracts covering involucre; leaves lobed below from near middle of blade, with dense whitish tomentum or wool on lower surface; secondary veins less than 1.5 cm long, mostly somewhat diverging, mostly spreading at more than 45°; limbs of rays with 10–15 longitudinal veins ..... *T. westonii*

Talamancalia boquetensis (Standley) H. Robinson & J. Cuatrecasas, comb. nov. Basionym: *Senecio boquetensis* Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 22: 394. 1940. *Pseudogynoxys boquetensis* (Standley) B. Turner, Phytologia 71: 206. 1991.

Distribution. Panama.

The specimens seen seem to have two forms. One specimen (*Grant & Rundell 92-02090*) has hirsute,

nonlanuginose stems, leaf undersurfaces without obvious wool, fistulose stems, and distinctly winged petioles. In contrast, the type (*Pittier 5382*) and a collection bearing the unpublished name "Senecio whiteae" Greenman (*Dwyer 353*) have a distinct thin wool on the leaf undersurfaces and a petiole that is scarcely winged in the part just above the base. Of the two specimens, the type has nonfistulose stems and acute leaf tips, while the Dwyer specimen has fistulose stems and leaf tips acuminate. The Grant and Rundell specimen is from 4 km southwest of Las Mellizas near the Costa Rican border. The type and the Dwyer collection are from near Boquete.

Barkley (1975) stated that heads sometimes lack rays, and they seem to be lacking in some heads of the type specimen. Close examination shows that abraded remnants of rays are usually present in these heads.

Talamancalia westonii H. Robinson & J. Cuatrecasas, sp. nov. TYPE: Costa Rica. San José: Cerro Lohmann, Chirripó National Park, ca. 3,100 m, 11 Feb. 1981, *A. S. Weston 12373* (holotype, US). Figure 1.

In habitu fruticoso in internodis brevibus in foliis sub mediis lobatis et subtus dense albo-tomentosis in nervis secundariis brevibus leniter divergentibus in capitulis paucis magnis et in bracteis calyculis magnis late ovatis differt.

Shrub ca. 30 cm high, with 2 or 3 branches from base; stems with white wool, less wool when old, internodes 0.5–1.0 cm long, with solid pith. Leaves alternate, bases expanded, clasping part on each side of stem to 5 mm wide; petioles ca. 1 cm long, scarcely winged near base, bearing lobes above; blades narrowly ovate, 5.0–5.5 cm long, 1.7–2.5 cm wide, basal ¼–½ lobed, margin above middle irregularly serrate, apex narrowly acute, upper surface densely hirsute with hairs bearing white-flagellate tips, lower surface densely white-tomentose, secondary veins 8–10, spreading mostly at more than 45° angle, 1.5 cm or less long, somewhat diverging toward margin. Inflorescence terminal, branches 4–5 cm long, thinly lanuginose, bearing 2–4 heads; bracts foliiform, sessile, ovate, 2.5–3.5 cm long, ca. 1.5 cm wide; peduncles 0.5–1.0 cm long. Heads broadly campanulate, 2.0–2.3 cm high; calycular bracts covering involucre, ca. 7, broadly ovate to oblong-ovate, 10–12 mm long, 7–9 mm wide, apex acute to short acuminate, outer surface thinly lanuginose; involucral bracts ca. 13, 10–11 mm long, 1.5–2.0 mm wide, narrowly acute, thinly lanuginose outside; ray florets ca. 15; corollas orange, glabrous, basal tube ca. 9 mm long, limb ca. 19 mm long, 5.5–6.0 mm wide, with 10–15 longitudinal veins, minutely trilobed at tip, staminodea present; disk florets 80–90; corollas orange, glabrous, basal tube 12–13 mm long, throat 2.5–3.0 mm long, lobes ca. 4 mm long, 0.7 mm wide; anther collars ca. 0.5 mm long; anther thecae ca. 3.5 mm long, apical appendage ca. 0.7 mm long. Achenes ca. 3 mm long, covered with broadened setulae; pappus bristles ca. 7 mm long.

The label indicates the plant is a shrub 30 cm tall, with 2 or 3 branches from the base, the heads are radiate and bright orange, and the plants were very rare on an east-facing cliff of Cerro Lohmann. Weston mentioned on his label that the plant somewhat resembled, in a gross way, *S. boquetensis* Standley.

Actual mucilage has not been seen issuing from the setulae of the achenes of *Talamancalia westonii*. However, the setulae are somewhat broadened like those of the type specimen of *Talamancalia boquetensis*, where mucilage has been seen.

Acknowledgment. The photograph of *Talamancalia westonii* was copied by Victor E. Krantz, Staff Photographer, National Museum of Natural History, Smithsonian Institution.

Literature Cited

Barkley, T. M. 1975. VIII. Senecioneae. *In:* R. E. Woodson & R. W. Schery (editors), Flora of Panama. Ann. Missouri Bot. Gard. 62: 1244–1272.

Cuatrecasas, J. 1986. Dos géneros de Compositae de Colombia. Caldasia 15: 1–14.

Jeffrey, C. 1992. The tribe Senecioneae (Compositae) in the Mascarene Islands with an annotated World check-list of the genera of the tribe. Notes on Compositae VI. Kew Bull. 47: 49–109.

Nordenstam, B. 1978. Taxonomic studies in the tribe Senecioneae (Compositae). Opera Bot. 44: 1–83.

Robinson, H. & J. Cuatrecasas. 1977. Notes on the genus and species limits of *Pseudogynoxys* (Greenm.) Cabrera. Phytologia 36: 177–192.

Turner, B. L. 1991. Transfer of two species of *Senecio* to *Pseudogynoxys* (Asteraceae–Senecioneae). Phytologia 71: 205–207.

New Combinations in the *Heterotheca villosa* (Pursh) Shinners Complex (Compositae: Astereae)

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ABSTRACT. New combinations in the *Heterotheca villosa* complex were deemed necessary for a pending revision of *Heterotheca* sect. *Phyllotheca*. Based on extensive fieldwork and examination of a large number of herbarium collections, the following new combinations are proposed: *Heterotheca stenophylla* var. *angustifolia*, *H. villosa* var. *ballardii*, *H. villosa* var. *depressa*, *H. villosa* var. *horrida*, *H. villosa* var. *minor*, and *H. villosa* var. *nana*.

During investigations leading to a revision of *Heterotheca* sect. *Phyllotheca* Nuttall and systematics papers on various aspects of the biology of members of the section, the following new combinations were determined to be required. Nomenclatural decisions were reached after examining more than 8,700 herbarium specimens of *H.* sect. *Phyllotheca*. Semple (1990) presented a possible conservative synonymy for *H. villosa* (Pursh) Shinners, noting that several additional varieties might warrant recognition based on additional data. Multivariate morphometric analyses completed since 1990 indicate that upper stem leaf shape and the numbers of hairs and glands per unit area of leaf surface are useful in delimiting taxa within the highly variable *H. villosa* complex. The details of these analyses will be published elsewhere.

Heterotheca stenophylla (A. Gray) Shinners var. **angustifolia** (Rydberg) Semple, comb. nov. Basionym: *Chrysopsis angustifolia* Rydberg, Bull. Torrey Bot. Club 37: 128. 1910. *Chrysopsis villosa* (Pursh) Nuttall var. *angustifolia* (Rydberg) Cronquist, Bull. Torrey Bot. Club 74: 150. 1947. *Heterotheca villosa* (Pursh) Shinners var. *angustifolia* (Rydberg) Harms, Wrightia 4: 16. 1968. TYPE: U.S.A. Nebraska: Hooker Co., near Mullen, Middle Loup River, 14 Sep. 1893, *Rydberg 1766* (lectotype, selected by Semple (1990), NY; isolectotypes, GH, NY, US).

This is the common, moderately pubescent and eglandular goldenaster on the eastern prairies from Texas north to South Dakota. The type would be identified as a member of *H. stenophylla*, if it was glandular like members of variety *stenophylla*. The two varieties occur in pure and mixed populations throughout the range of the species. Most individuals in *H. stenophylla* have narrow oblanceolate leaves that are usually crowded and ascending and have distinctly larger hairs along much of the leaf margin than on the surfaces. Leaf surface hairs in both varieties of *H. stenophylla* often have a broader base than normal in section *Phyllotheca*. In the southern part of its range, variety *angustifolia* can be quite similar to *H. canescens* (DC.) Shinners. In the northern part of its range, variety *angustifolia* can be similar to *H. villosa* var. *villosa*. Plants from Nebraska, Oklahoma, and Texas treated as *H. villosa* var. *foliosa* in floras belong in *H. stenophylla* var. *angustifolia*. In the Black Hills area of South Dakota, which is at the limits of distribution for both taxa, *H. stenophylla* var. *angustifolia* and *H. villosa* var. *foliosa* can be difficult to distinguish. Local hybridization between *H. villosa* and *H. stenophylla* undoubtedly occurs in the northern part of the range of the latter species.

Heterotheca villosa (Pursh) Shinners var. **ballardii** (Rydberg) Semple, comb. et stat. nov. Basionym: *Chrysopsis ballardii* Rydberg, Brittonia 1: 100. 1931. TYPE: U.S.A. Minnesota: Chaska, July 1891, *Ballard 640* (holotype, MIN).

This is the generally robust, larger-headed, many-rayed, eglandular, oblong-leaved race of the species occurring on the northeastern prairies of Canada and the United States. Typical variety *villosa* has oblanceolate leaves and smaller heads with fewer rays.

Heterotheca villosa (Pursh) Shinners var. **depressa** (Rydberg) Semple, comb. et stat. nov. Basionym: *Chrysopsis depressa* Rydberg, Mem. New York Bot. Gard. 1: 381. 1900. *Heterotheca depressa* (Rydberg) Dorn, Vasc. Pl. Wyoming. 295. 1988. TYPE: U.S.A. Wyoming: Yellowstone National Park, Lower Geyser Basin, 4 Aug. 1897, *Rydberg & Bessey 5067* (holotype, NY; isotypes, CAN, US).

This is the generally small-statured, smaller-headed, few-rayed, densely pubescent and very sparsely glandular race of the species that occurs in typical form in the vicinity of hotsprings and geysers in Yellowstone National Park in Wyoming. Less typical plants also have been collected in the nearby Teton National Park. Members of variety *minor* and plants intermediate between variety *depressa* and variety *minor* occur in both parks. Field observations indicate that typical variety *depressa* is common near the type locale and other hotsprings and geysers in Upper Geyser Basin, while variety *minor* is common in other areas of Yellowstone National Park. Dorn (1988) treated variety *depressa* as a separate species. Our numerical analyses indicate that too many plants intermediate between variety *depressa* and variety *minor* occur to justify species status. Both varieties are tetraploid in the area of sympatry.

Heterotheca villosa (Pursh) Shinners var. **minor** (Hooker) Semple, comb. nov. Basionym: *Chrysopsis villosa* (Pursh) Nuttall [var.] *β minor* Hooker, London J. Bot. 6: 244. 1847. TYPE: U.S.A. [Wyoming: Sweetwater Co.,] "Oregon [Territory], on the granite masses of the Sweet Water River, only fringing the fissures," July 1843, *Geyer 7* (holotype, K; isotypes, GH, K ex Bentham, NY).

Diplopappus hispida Hooker, Fl. Bor. Amer. 27: 22. 1834. *Chrysopsis hispida* (Hooker) DC., Prod. 7: 279. 1836. *Chrysopis villosa* (Pursh) Nuttall var. *hispida* (Hooker) A. Gray, Synop. Fl. N. Amer. 1, 2: 123. 1884. *Heterotheca villosa* (Pursh) Shinners var. *hispida* (Hooker) Harms, Brittonia 26: 61. 1974. TYPE: Canada. Saskatchewan: Carlton House [Fort], 1827, *Richardson s.n.* (lectotype, selected by Semple (1990), BM, shoot No. 2).

This variety has long been recognized as variety *hispida*, a name that does not have priority at the varietal rank. The holotype of variety *minor* is a small-headed individual with oblanceolate leaves that are about average in hair density for the variety and considerably, but not significantly, above average in gland density. The type of *Diplopappus hispidus* has leaves with indument density very low for variety *minor*. If variety *hispida* were to be recognized as a separate taxon, then many other local and rare morphs occurring in the Rocky Mountains would also need to be recognized to be consistent. However, there are numerous individuals with intermediate traits.

Heterotheca villosa (Pursh) Shinners var. **horrida** (Hooker) Semple, comb. et stat. nov. Basionym: *Chrysopsis horrida* Rydberg, Bull. Torrey Bot. Club 31: 648. 1904. *Heterotheca horrida* (Rydberg) Harms, Wrightia 4: 17. 1968. TYPE: U.S.A. Colorado: New Windsor, 8 Aug. 1900, *Osterhout 2326* (holotype, NY; isotypes, RM(2), WIS).

This is the common foothills and prairie race of the species occurring from southeastern Wyoming to central New Mexico and west to northeastern Arizona. It is similar to variety *minor* in indument and differs in having oblong versus oblanceolate upper stem leaves. The capitulescence is generally compact and rather umbelliform. This variety has been recognized as a species in some floras (e.g., Harms, in Correll & Johnston, 1970; Great Plains Flora Association, 1986; Dorn, 1988). Semple (1990) placed it in synonymy under *H. villosa* var. *hispida* (= var. *minor*) on the basis of similiarity in indument features.

Heterotheca villosa (Pursh) Shinners var. **nana** (A. Gray) Semple, comb. nov. Basionym: *Chrysopsis canescens* (DC.) Torrey & Gray var. *nana* A. Gray, Mem. Amer. Acad. Arts 4: 78. 1849. TYPE: U.S.A. New Mexico: [possibly Mora Co.:] "elevated rocky region 2 mi. E of the Mora River," Aug 1847, *Fendler* [391c] (holotype, GH).

This is a dwarf, rare form of the species that is similar to variety *horrida*, but differs in having smaller heads and much smaller leaves that have many more glands. If variety *horrida* and variety *nana* are treated as convarietal, then the name variety *nana* has priority.

Literature Cited

Dorn, R. D. 1988. Vascular Plants of Wyoming. Mountain West Publishing, Cheyenne, Wyoming.

Great Plains Flora Association. 1986. Flora of the Great Plains. Univ. Kansas Press, Lawrence.

Harms, V. 1970. *Heterotheca*. Pp. 1563–1569 *in* Correll & Johnston, Manual of the Vascular Plants of Texas. Texas Research Foundation. Renner, Texas.

Semple, J. C. 1990. Neotypification of *Amellus villosus*, the identity of a Bradbury collection, and typification of some other goldenasters (Compositae: Astereae). Brittonia 42: 221–228.

Two New Species of *Palicourea* (Rubiaceae) from Western South America

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ABSTRACT. The new species *Palicourea jatun-sachensis* and *P. plowmannii* are similar vegetatively to *P. subspicata*, but can be separated by linear relatively long calyx lobes and well-developed inflorescence bracts, respectively.

The neotropical genus *Palicourea* Aublet comprises about 200 species of shrubs, small trees, and suffrutescent herbs found widely in moist to wet forest. It is closely related to *Psychotria* subg. *Heteropsychotria* Steyermark, from which it is separated by its corollas that are generally relatively longer and tubular to infundibuliform and have a basal swelling that is closed at the top by a ring of dense pubescence borne on the inside of the corolla. Additionally, the inflorescences are characteristically brightly colored and the corollas are often strongly gibbous and asymmetrical at the apex, but these features vary widely within the genus (Taylor, 1989).

Palicourea jatun-sachensis C. M. Taylor, sp. nov. TYPE: Ecuador. Prov. Napo: Cantón Tena, Estación Biológica Jatun Sacha, ca. 8 km ESE of Puerto Misahuallí, 1°04′S, 77°37′W, *J. S. Miller & Medical Botany Class 2167* (holotype, MO). Figure 1A, B.

A *Palicourea subspicata* Huber panicula breviore purpurea violaceave etiam bracteis inflorescentiae sicut lobulis calycinis linearibus longioribus differt.

Suffrutescent herbs or shrubs to 2.5 m tall, flowering at 0.3 m; stems glabrous. Leaves paired, with blades 20–33 cm long, 8.5–16 cm wide, 1.6–2.4 times as long as wide, elliptic, at apex acuminate with tip 5–20 mm long, at base cuneate to obtuse, papyraceous to thinly chartaceous, sparsely to usually densely pustulose abaxially but otherwise glabrous; secondary veins 14–17 pairs, widely spreading, broadly curved, sometimes looping to interconnect near apex, without domatia, costa and secondary veins usually prominulous above and below, occasionally with 1(–2) weakly developed intersecondary veins present between pairs of secondary veins; petioles 30–57 mm long, glabrous; stipules united to form a continuous sheath, glabrous; sheath 1–3 mm long, interpetiolar sinus concave to usually truncate; lobes 6–17 mm long, lanceolate to ovate, acute, usually deciduous after distalmost 1–2 nodes. Inflorescences racemiform, narrowly cylindrical; peduncles 3.5–14 cm long; panicles 1.5–4.5 cm long, 1.5–4 cm wide, 0.9–1.8 times as long as wide, with flowers borne in congested cymules of 3–5; axis somewhat thickened; bracts 3–10 mm long, linear, acute; pedicels 0–1.5 mm long, thickened; peduncle, axis, branches, bracts, and pedicels minutely puberulous, purple or violet; flowers with calyx puberulous to usually glabrescent, purple to violet; hypanthium cylindrical, 1–1.2 mm long; limb 1.5–5.5 mm long, divided to base, lobes narrowly triangular to linear, acute; corolla red, sometimes tinged with yellow or yellow internally, membranaceous, tubular to somewhat funnelform, somewhat swollen at base, generally straight in tube, externally densely puberulous with stout multicellular trichomes ca. 0.1 mm long, internally glabrous except for a ring of villous pubescence just above the basal swelling; tube 11–15 mm long; lobes 1–2 mm long, triangular. Infructescences similar in size, proportion, and color to inflorescences, with fruiting pedicels 2–10 mm long; fruit ca. 5 mm long, ca. 8.5 mm wide, didymous, the halves subglobose, laterally somewhat flattened, purple; pyrenes with 3–5 gently angled faces.

Uncommon in understory of wet primary forest at 280–400 m in Amazonian Colombia and Ecuador. Collected in flower February–August and October, in fruit January, April, and July.

This species is distinguished by its relatively large leaves, narrow racemiform inflorescences, narrowly triangular to linear bracts, long narrow calyx lobes, and didymous fruits with gently angled pyrenes. The stipules deciduous after the distalmost 1–2 nodes represent an unusual condition in *Palicourea*. This new species is simlar to *P. subspicata* Huber, which can be distinguished by its inflorescences with long panicles, 6.5–23 cm long, calyx limb shorter, ca. 0.8 mm long, and pyrenes smooth.

The specific epithet refers to the Jatun Sacha Biological Station, where most of the specimens of this species have been collected.

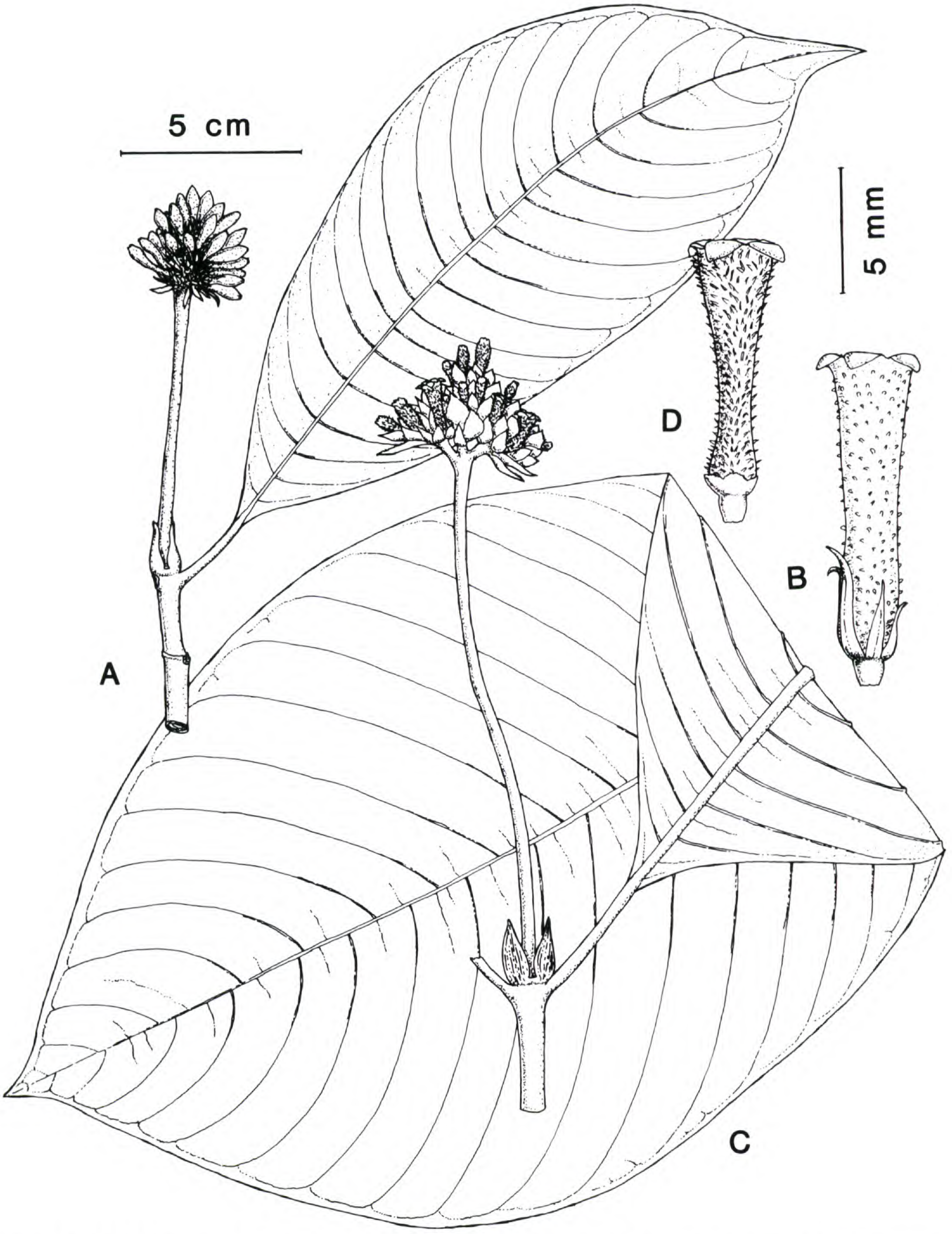

Figure 1. A, B, *Palicourea jatun-sachensis* C. M. Taylor. —A. Habit. —B. Flower at anthesis. —C, D, *Palicourea plowmannii* D. Simpson ex C. M. Taylor. —C. Habit. —D. Flower at anthesis. A, C to same scale (5 cm bar); B, D to same scale (5 mm bar). A, B from *Miller et al. 2167* (MO); C, D from *Knapp & Mallet 6940* (MO).

Additional specimens examined. COLOMBIA. **Prov. Caquetá:** 13 km SE of Morelia on road to Río Pescado, SW of Florencia, *Davidse et al. 5681* (MO). ECUADOR. **Prov. Napo:** Cantón Tena, Estación Biológica Jatun Sacha, ca. 8 km ESE of Puerto Misahuallí, 1°04′S, 77°37′W, *Cerón 1221* (MO), *3586* (MO), *Croat 73404* (MO), *Flynn et al. 4028* (MO, PTBG), *McDade 1086* (MO), *Palacios 1371* (MO), *2462* (MO), *2501* (MO),

Palacios & Neill 1521 (MO), *Palacios et al. 478* (MO), *Rueda 1137* (MO); Río Napo, Pañococha (Oasis), *Harling et al. 7564* (MO). **Prov. Pastaza:** vía Auca, 115 km al sur de Coca, 10 km al sur de la frontera Napo–Pastaza, cerca del río Tigüina, carretera de Petro-Canada, *Hurtado et al. 1366* (MO).

Palicourea plowmanii D. Simpson ex C. M. Taylor, sp. nov. TYPE: Peru. Dept. San Martín: Lamas, Naranjal, trail to Jorge Chávez, Km 85 of Tarapoto–Yurimaguas road, 6°17′S, 76°17′W, *S. Knapp & J. Mallet 6940* (holotype, MO). Figure 1C, D.

A *Palicourea subspicata* Huber lobulis stipularibus diu persistentibus, panicula brevi ex pyramidali hemisphaerica, bracteis inflorescentiae bene evolutis, etio fructu no didymo differt.

Little-branched or monopodial shrubs to 2.5 m tall, stems glabrous or puberulous to pilosulous. Leaves paired, with blades 24–32.5 cm long, 18.5–25 cm wide, 1.3–1.5 times as long as wide, elliptic to broadly so, at apex acute to acuminate with tip 2–5 mm long, at base cuneate to rounded, papyraceous to thinly chartaceous, glabrous and dark velvety green adaxially or sometimes the veins white or purple, abaxially minutely pustulose and glabrescent or sometimes puberulous to pilosulous and purple throughout; secondary veins 17–24 pairs, spreading to ascending, broadly curved, usually looping to interconnect distally, without domatia, costa and secondary veins prominulous above and below, occasionally 1 weak intersecondary vein present between pairs of secondary veins; petioles 25–60 mm long, glabrescent or puberulous to pilosulous; stipules united to form a continuous sheath, glabrescent or puberulous to pilosulous; sheath ca. 1 mm long, interpetiolar sinus truncate to usually concave; lobes 17–35 mm long, lanceolate to somewhat ovate, acute, sometimes ciliolate. Inflorescences terminal, pyramidal to somewhat rounded; peduncles 7–21.5 cm long; panicles 2.5–4.5 cm long, 4–9 cm wide, 0.5–0.8 times as long as wide, with flowers borne in congested cymules of 3–7; primary branches not subtended by bracts; bracts 2.5–17 mm long, 1–6 mm wide, narrowly triangular or usually elliptic to broadly so, acute to acuminate, entire or usually ciliolate; pedicels 0–1.5 mm long; peduncle, axis, branches, bracts, and pedicels bright purple or magenta, pilosulous; flowers with calyx bright purple to magenta, glabrescent; hypanthium 1–1.5 mm long, cylindrical to turbinate; limb 0.8–1.2 mm long, subtruncate to denticulate or shallowly lobed, entire or usually ciliolate; corollas red-purple to deep pink or usually blue, tubular to somewhat infundibuliform, somewhat swollen and strongly bent at base, generally straight in tube, membranaceous, externally densely puberulous with slender multicellular colored trichomes 0.5–1 mm long, internally glabrous except for a densely villous ring ca. 1 mm wide just above basal swelling; tube 9–12 mm long; lobes 1–2.5 mm long, triangular, the sinuses usually thickened and extruded in bud. Infructescences similar in size, proportion, and color to inflorescences; fruits ca. 5 mm long, 5–6 mm wide, ellipsoid to ovoid, flattened laterally, purple; pyrenes with 4–5 rounded longitudinal ridges.

Infrequent in wet forest at 180–800 m in the Amazonian region of Peru. Collected in flower April, October, and November, in fruit April and November.

This species is distinguished by its relatively large leaves and stipules, short pyramidal to rounded inflorescences, relatively large inflorescence bracts, bright purple or magenta inflorescences with purple to blue flowers, subtruncate calyx limb, and densely hirsutulous or pilosulous corollas. It is similar to *Palicourea subspicata* Huber and *P. jatun-sachensis*, from both of which it can be distinguished by the features noted above.

Donald Simpson, formerly of the Field Museum of Natural History, proposed the specific epithet in honor of Timothy Plowman, also of that institution, but did not publish this name.

Additional specimens examined. PERU. **Cuzco:** Prov. Paucartambo, road from Pillcopata to Patrias, *Maas et al. 6148* (MO); Río Tambopata, 2 km E of the Colpa de Guacamayos, *Núñez 6532* (MO). **Loreto:** Prov. Maynas, Río Ampiyacu, Puca Urquillo and vicinity, 3°05′S, 71°55′W, *Plowman et al. 6950* (F). **Madre de Dios:** Tambopata, a 39 km de Puerto Maldonado, alrededor de Planchón, 12°35′S, 69°10′W, *Núñez & Quispe 10054* (MO); Tambopata Wildlife Reserve, 30 km S of Puerto Maldonado, 12°15′S, 69°17′W, trail on S side of La Torre River, *Young & Stratton 173* (MO), *257* (MO), *288* (MO). **San Martín:** Prov. Lamas, Convento, trail to Tioyacu and Nuevo Lamas, Km 68 of Tarapoto–Yurimaguas road, 6°16′S, 76°17′W, *Knapp & Mallet 6989* (MO); Caserío Bonilla, trail to E of Tarapoto–Yurimaguas road at Km 75, 6°16′S, 76°17′W, *Knapp & Mallet 7135* (MO).

Acknowledgments. I thank the Field Museum of Natural History for making specimens available, and Roy E. Gereau for help in preparing the Latin diagnoses.

Literature Cited

Taylor, C. M. 1989. Revision of *Palicourea* (Rubiaceae) in Mexico and Central America. Syst. Bot. Monogr. 26: 1–102.

Novelties in Neotropical Lauraceae

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ABSTRACT. Intensive collecting efforts during recent years have resulted in a large number of Lauraceae collections. Attempts at their identification have shown that many Lauraceae species are still undescribed. In this contribution ten species are described, and one may expect articles describing additional species at regular intervals.

Aiouea grandifolia van der Werff, sp. nov. TYPE: Peru. Depto. San Martín: Distr. Tocache Nuevo, Fundo Geroglífico del Mr. Luis Ludena, alt. 400 m, tree, 20 m, *Schunke Vigo 8109* (fl) (holotype, MO; isotype, U). Figure 1.

Arbor, 20 m. Ramuli parum angulati vel rotundati, glabri, fistulosi. Gemma terminalis pubescens. Folia alterna, firme chartacea, 20–35 × 10–17 cm, elliptica, basi et apice acuta vel obtusa, supra glabra, subtus dense punctata, glabra vel pilis adpressis praedita, nervis lateralibus 5–7; costa supra impressa, nervis lateralibus immersis, costa nervisque subtus prominenter elevatis. Petioli 2.4–5.1 cm, canaliculati, glabri. Inflorescentiae secus brachyblastos dispositae, ad 10 cm longae, basi sparse puberulae, parte distali glabrescentes. Pedicelli glabri, 2–4 mm longi. Flores glabri. Tepala 6, aequalia, ovata, 1 mm longa, stamina 6, 2-locellata, introrsa, ca. 1 mm longa, filamento paullo ultra locellos producto, staminodia 6, ad verticillos III et IV referentia; glandulae basi staminodiorum verticilli III praesentes. Ovarium globosum, glabrum, 1.7 mm diametro; tubo florali basi glabro, ad orificium dense pubescente. Infructescentia ad 18 cm longa; fructus ellipsoideus, 2.8–1.4 cm, cupula ca. 1.5 cm lata, 0.8 cm longa.

Tree, to 20 m tall. Twigs slightly angular or rounded, glabrous, fistulose. Terminal bud pubescent. Leaves alternate, firmly chartaceous, 20–35 × 10–17 cm, elliptic, base and tip acute or obtuse, upper surface glabrous, lower surface densely gland-dotted and glabrous or with varying amounts of very short, appressed hairs; lateral veins 5–7 on each side; midrib impressed on upper surface, lateral veins and reticulation immersed; midrib and lateral veins strongly raised on lower surface, tertiary venation slightly raised. Petioles 2.4–5.1 cm long, canaliculate, glabrous. Inflorescenses in axils of deciduous bracts, to 10 cm long, grouped along short (to 1 cm long) leafless shoots, sparsely puberulous near the base, the distal parts becoming glabrous, bracts not present at anthesis. Pedicels glabrous, 2–4 mm long. Flowers glabrous. Tepals 6, equal, erect at anthesis, shorter than the floral tube, ovate, ca. 1 mm long, persistent, but not enlarged in young fruiting stage. Stamens of whorls I and II (outer six stamens) fertile, 2-celled, introrse, ca. 1 mm long, the filament slightly prolonged beyond the locelli, about as long as the anther, sparsely puberulous near the base. Whorl III staminodial (occasionally a small locellus present), ventrally densely pubescent, ca. 1 mm long, each stamen with two large, globose glands attached slightly above the base. Staminodia of whorl IV present, stipitiform, the lower half densely pubescent, ca. 0.8 mm long. Ovary globose, glabrous, 1.7 mm diam., style slender, 0.7 mm long; floral tube near base glabrous, becoming densely pubescent near the orifice. Infructescence to 18 cm long, fruit ellipsoid, 2.8 × 1.4 cm, cupule cup-shaped, ca. 1.5 cm wide, 0.8 cm high, tepals at maturity of fruit worn off.

Flowers: August; fruits: January–June.

The following sterile collections very likely represent this species as well: Colombia. Amazonas: Pto. Nariño, *Rudas et al. 1726* (MO) and Brazil. Amazonas: Reserva Florestal Ducke, *Nascimento 330* and *Coelho s.n.* = *INPA 42219*.

Aiouea grandifolia, only known from the lowlands of eastern Peru, can be readily recognized by its large leaves, strongly raised midrib on lower leaf surface, and fistulose twigs. The only other *Aiouea* species with large leaves is *A. angulata*, known from one Colombian collection. This species has strongly angled twigs, nine fertile stamens, attenuate or acute leaf bases, and lacks leafless short shoots that carry inflorescences. In Renner's (1982) revision of *Aiouea*, *A. grandifolia* will key to three species that have only stamens of whorls I and II fertile. These species differ from *A. grandifolia* in numerous details: *A. saligna* has lanceolate leaves and occurs in southern Brazil; *A. trinervis* is a shrub or small tree in cerrado with coriaceous leaves and pubescent twigs; and *A. laevis* is an Amazonian tree with hirsute flowers, larger, more intricately branched inflorescences, and smaller flowers.

Inflorescences grouped along leafless short shoots are uncommon among neotropical Lauraceae, but occur in several other *Aiouea* species (*A. benthamiana*, *A. guianensis*, *A. maguireana*, *A. myristi-*

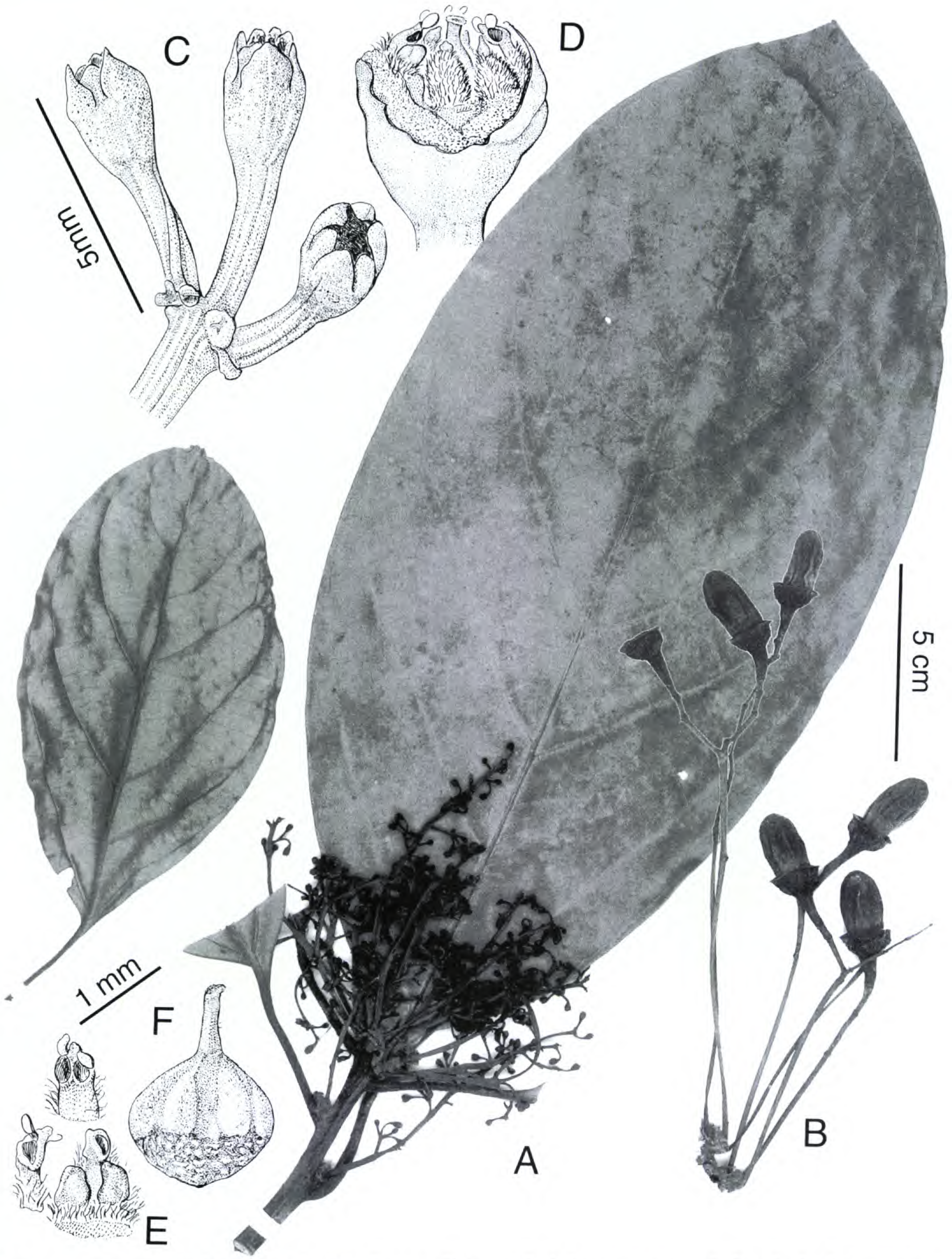

Figure 1. *Aiouea grandifolia* van der Werff. —A. Habit. —B. Infructescence. —C. Detail of inflorescence. —D. Flower. —E. Stamens. —F. Pistil.

coides, and *A. saligna*). Whether other *Aiouea* species have persistent tepals needs further investigation. The aspect of *A. grandifolia* is quite unlike the other *Aiouea* species. If one disregards the two-celled stamens, one cannot help but notice a strong resemblence with the recently described *Cinnamomum napoense* van der Werff from Amazonian Ecuador: both have hollow stems, inflorescences clustered along leafless short shoots, a similarly strongly raised costa on lower leaf surface, and strongly gland-

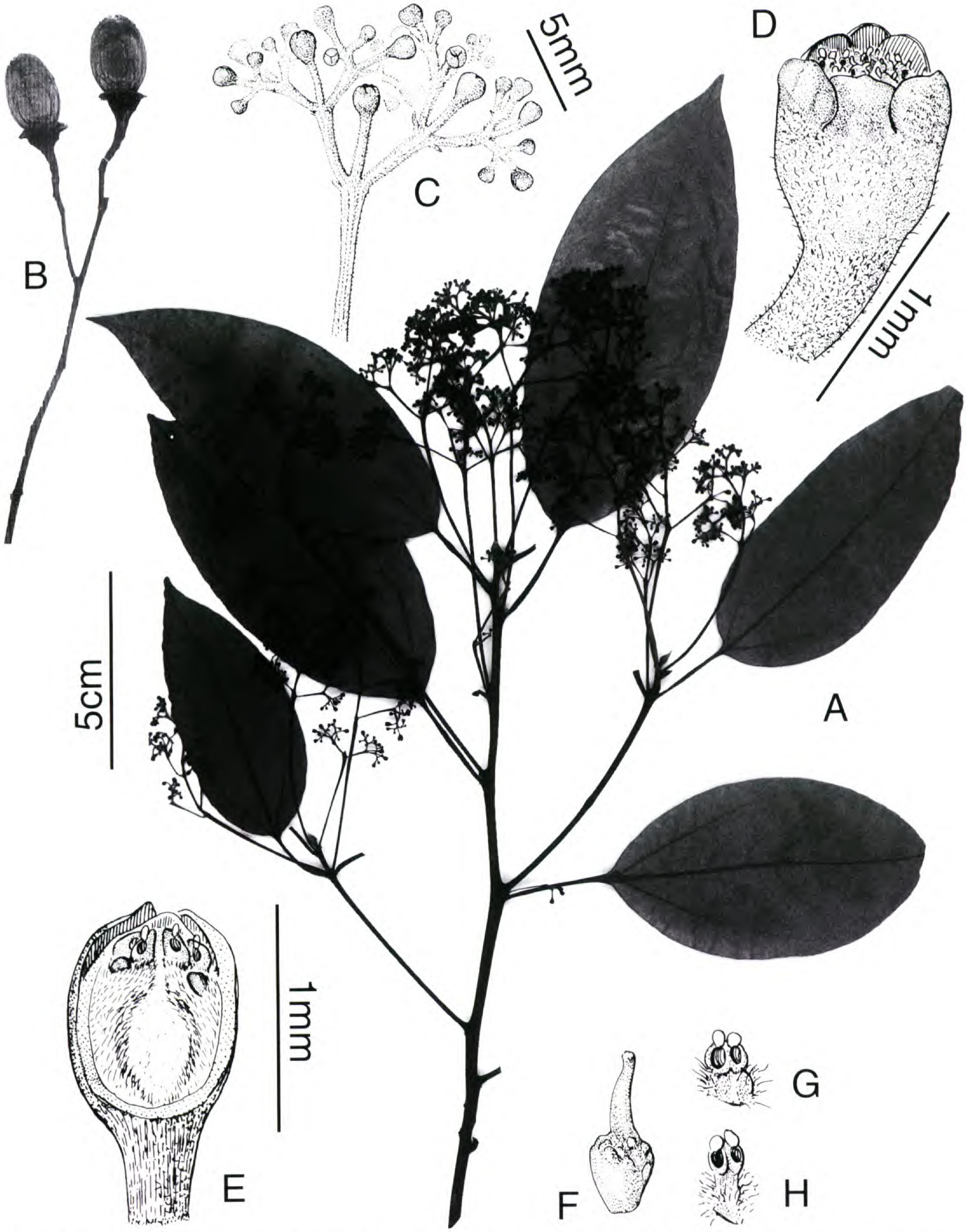

Figure 2. *Aiouea longipetiolata* van der Werff. —A. Habit. —B. Fruits. —C. Part of inflorescence. —D. Flower. —E. Flower in cross section. —F. Pistil. —G, H. Stamens.

dotted lower leaf surfaces. Although the two can be easily identified when flowers are present, sterile or fruiting specimens are hard to separate. *Aiouea grandifolia* has relatively wider, firmer leaves than *C. napoense;* leaves in *A. grandifolia* are often somewhat shiny, but usually opaque in *C. napoense.*

Paratypes. PERU. **Loreto:** Maynas, Explorama Reserve at Indiana, *Gentry et al. 65760* (fr) (MO), *Gentry et al. 54654* (fr) (MO), *Gentry et al. 31455* (fr) (MO), *Grandez et al. 4109* (fr) (MO), *Grandez et al. 3834* (fr) (MO), *Vásquez & Ayala 13408* (fr) (MO); *Vásquez et al. 13469* (fr) (MO). **Madre de Dios:** Manu National Park, Cocha Cashu uplands, *Nuñez et al. 14592* (st)

(MO); Tambopata, Explorer's Inn tourist camp, *Gentry et al. 45938* (st) (MO), *Gentry et al. 51097* (st) (MO), *Gentry et al. 51491* (st) (MO).

Aiouea longipetiolata van der Werff, sp. nov. TYPE: French Guiana. Saül: La Fumée West, ca. 300 m, tree, 35 m, *Mori et al. 20758* (fl) (holotype, MO). Figure 2.

Arbor, ad 35 m. Ramuli parum angulati, minute tomentelli, glabrescentes. Folia alterna, firme chartacea, 10–17 × 4–7.5 cm, elliptica vel ovata, basi obtusa vel rotundata, apice acuta, supra glabra, subtus pilis parvis, brunneis praedita, nervis lateralibus 3–5 utroque costae latere, basilibus quam distalibus magis evolutis, costa supra impressa, subtus elevata; nervis supra immersis, subtus elevatis, reticulatione supra immersa, subtus paullo elevata. Petioli 2.7–3.5 cm longi, canaliculati. Inflorescentiae axillis foliorum ortae, 8–14 cm longae, tomentellae. Pedicelli ad 4(5) mm longi. Flores basi paullo pubescentes, apicem versus glabrescentes, 1.5–2 mm longi. Tepala 6, sub anthesi erecta, tubo florale perbreviora, post anthesin omnia basibus unitis dehiscentia. Stamina 9, 2-locellata, 6 exteriora introrsa, 3 interiora lateralia; stamina interiora filamento pubescentia; staminodia 3, basi pubescentia. Ovarium glabrum, globosum, ca. 1.2 mm longum, stylo distincto, ca. 0.7 mm longo; receptaculum intus dense pubescens. Fructus ellipsoideus, 3 × 1.7 cm, cupula vadosa, ca. 1.5 cm diametro, sensim in pedicello attenuata.

Tree, to 35 m, with buttresses. Twigs slightly angular, solid, minutely brown-tomentellous, becoming glabrous with age. Terminal bud densely light-brown tomentellous. Leaves alternate, firmly chartaceous, 10–17 × 4–7.5 cm, elliptic or ovate, base obtuse or rounded, tip acute, the upper surface glabrous, lower surface with scattered, minute (< 0.1 mm), brown hairs, the margin cartilaginous, lateral veins 3–5, the lowest pair stronger developed than the upper ones, midrib slightly impressed on the upper surface, lateral veins and reticulation immersed, midrib and lateral veins raised on lower surface, reticulation slightly raised. Petioles 2.7–3.5 cm long, canaliculate, with same indument as twigs. Inflorescences in axils of leaves, 8–14 cm long, paniculate, the lateral branchlets 3–4 times cymosely branched, brown-tomentellous. Pedicels to 4(5) mm long, tomentellous. Flowers at the base slightly tomentellous, otherwise glabrous, 1.5–2 mm long. Tepals 6, erect at anthesis, much shorter than the floral tube, ca. 0.5 mm long, 1 mm wide, glabrous on both surfaces, united at the base and falling as a unit with the stamens in old flowers. Stamens 9, all 2-celled, the outer six opening introrse, the inner three lateral; outer stamens ca. 0.5 mm long, the filament slightly prolonged beyond the anther cells, dorsally near the base with some hairs, otherwise glabrous; inner three stamens ca. 0.7 mm long, ventrally densely pubescent, in some flowers appearing staminodial, glands globose, sessile, partly covered by the pubescence; staminodia 3, stipitate, densely pubescent. Ovary glabrous, ± globose, ca. 1.2 mm long, style distinct, ca. 0.7 mm long; receptacle deep, densely pubescent inside. Fruit ellipsoid, 3 × 1.7 cm, cupule very shallow, ca. 1.5 cm diam., gradually narrowed into the pedicel.

Flowers: August–November; fruits: March.

Aiouea longipetiolata is only known from French Guiana. In Renner's (1982) treatment of *Aiouea* for the *Flora Neotropica* it will key to *A. impressa* because of its slightly impressed costa, or *A. tomentella* because of the dense pubescence of the receptacle and of filaments of the inner three stamens and staminodia. However, *A. impressa* differs in its glabrous inflorescences, smaller, glabrous leaves with acute base, and more intricately branched inflorescences with smaller flowers. *Aiouea tomentella* is a poorly known species; a type fragment I have seen has a densely tomentellous lower leaf surface and is not tripliveined. The aspect of *A. longipetiolata* is characteristic, with its long petioled leaves, obtuse leaf bases, and tripliveined leaves. This aspect, in combination with the indument of the lower leaf surface, makes it possible to identify sterile specimens with confidence.

Some specimens of the species were distributed as *Phoebe cinnamomifolia* (HBK) Nees and are probably filed under this name in other herbaria. *Phoebe cinnamomifolia* has four-celled anthers, and the tepals are persistent in the fruiting stage.

Paratypes. FRENCH GUIANA. **Saül:** La Fumée, *Mori & Boom 14902* (fl) (MO), *Mori & Boom 15238* (fl) (MO), *Mori & Pipoly 15413* (fr) (MO); Village Wayampi Trois-Sauts, *Prévost & Sabatier 2801* (buds) (MO).

Aniba heterotepala van der Werff, sp. nov. TYPE: Peru. Loreto: Maynas, km 44 of road Iquitos–Nauta, property of CPI, Comité de Reforestación Iquitos, elev. 150 m, tree 26 m, fls. yellowish, Dec. 1988, *Vásquez & Jaramillo 11370* (holotype, MO; isotypes, AMAZ, F, G, HBG, NY, US). Figure 3.

Arbor, ad 26 m. Ramuli teretes, brunneo-tomentelli, glabrescentes. Gemma terminalis parva, tomentella. Folia alterna, subcoriacea, 10–27 × 3.5–9 cm, base obtusa, raro acuta vel rotundata, apice acuta vel acuminata, supra glabra, subtus papillosa, pilis parvis adpressis praedita; nervis lateralibus 7–11 utroque latere, in dimidio distale brochidodroma; costa nervisque supra parum impressis, reticulatione immersa; subtus costa nervisque elevatis, reticulatione paullo elevata. Petioli 1–2 cm longi. Inflorescentiae ad apices ramulorum aggregatae, in axillis bractearum (raro in axillis foliorum) ortae, tomentellae, 5–15 cm longae. Pedicelli 3–4 mm longi, tomentelli. Flores 2–3 mm longi, ca. 2.5 mm lati, sensim in pedicellis attenuati.

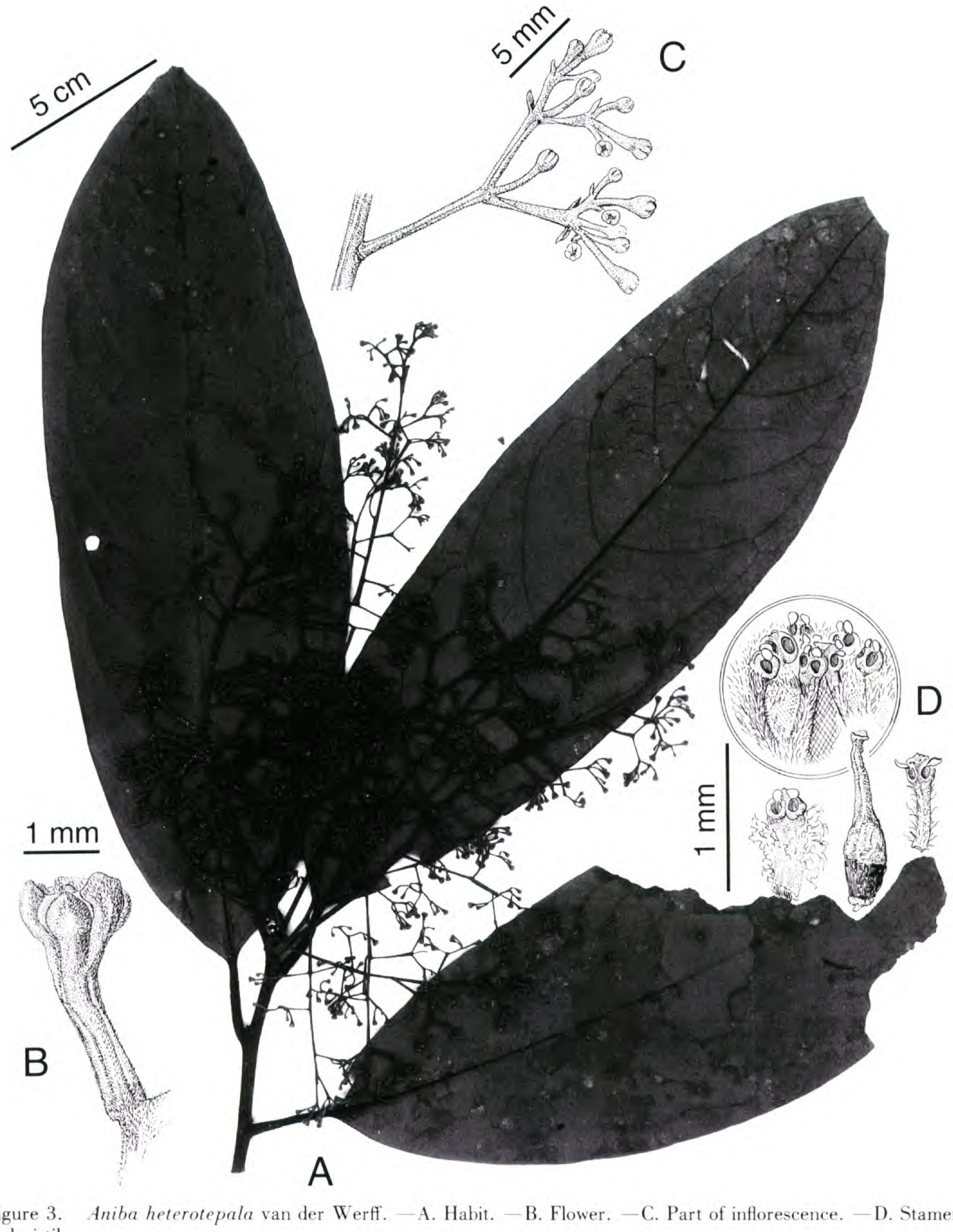

Figure 3. *Aniba heterotepala* van der Werff. —A. Habit. —B. Flower. —C. Part of inflorescence. —D. Stamens and pistil.

Tepala 6, inaequelia, tres exteriora ca. 1.1 × 1.4 mm, plus minusve erecta, tres interiora longiora et latiora, tertia parte distale incurvata; stamina 9, 2-locellata, 6 exteriora locellis introrsis, filamentis antheris angustioribus, dense lanato-pubescentibus; tres interiora glabra, locellis extrorsis, basi filamentorum duobus glandulis magnis praedita; staminodia nulla; pistillum glabrum; tubus floralis dimidio inferiore glaber et dimidio superiore pubescens vel omnino glaber. Fructus ignotus.

Tree, to 26 m tall. Twigs terete, brown-tomentellous, glabrescent with age. Terminal bud small, tomentellous. Leaves alternate, subcoriaceous, 10–27 × 2.5–9 cm, the base obtuse (rarely acute or rounded), apex acute or acuminate, upper surface glabrous, lower surface papillose, with small, scattered, appressed hairs, lateral veins 7–11 on each

side, arching upwards and loop-connected in the upper half of lamina, midrib and lateral veins slightly impressed on upper surface, tertiary venation immersed, midrib and lateral veins raised on lower surface, tertiary venation less so. Petioles 1–2 cm long. Inflorescences usually clustered at the tips of branches in axils of deciduous bracts, rarely in axils of leaves, tomentellous, 5–15 cm long, paniculate, flowers arranged in cymes, bracts lacking at anthesis. Pedicels 3–4 mm long, tomentellous. Flowers greenish yellow, 2–3 mm long, ca. 2.5 mm wide, the base gradually narrowed into the pedicel, tepals 6, unequal, the outer three ca. 1.1 × 1.4 mm, ± erect, inner three longer and wider, upper third incurved, tomentellous outside, glabrous inside, stamens 9, all 2-celled, outer six with the cells introrse, the cells opening upwards and the connective slightly prolonged beyond the anther cells, filaments densely woolly-pubescent, narrower than anthers; inner three stamens glabrous, the cells extrorse, with two large globose glands at base of filaments, staminodes lacking; pistil glabrous, ca. 2 mm long, the ovary gradually narrowed into the style; floral tube with lower half glabrous and upper half pubescent or entirely glabrous. Fruit unknown.

Aniba heterotepala is only known from the vicinity of Iquitos, Peru. Diagnostic is the combination of the papillose lower leaf surface, unequal tepals, and glabrous ovary. In two of the known collections the floral tube was partly pubescent (including the type), while in the other two it was entirely glabrous. The generally obtuse leaf bases are also a useful character. It is rather remarkable that no fruiting collections are known from this species because the leaf bases, the slightly impressed veins on the upper surface, and the loop-connected lateral veins are fairly good vegetative characters.

In the recent revision of *Aniba* (Kubitzki, 1982), *A. heterotepala* will key to *A. cylindrica* because of its papillose lower leaf surface and glabrous gynoecium. However, *A. heterotepala* differs in having unequal tepals and broader leaves, usually with an obtuse base.

Paratypes. PERU. **Loreto:** Puerto Almendras, *Croat 19010* (fl) (AMAZ, MO). **Maynas:** Estación Biológica Río Blanco, elev. 150 m, *Vásquez et al. 6752* (fl) (AMAZ, MO); Puerto Almendras, elev. 120 m, *Vásquez & Jaramillo 6862* (fl) (MO, AMAZ), *Grandez & Jaramillo 1851* (AMAZ, MO).

Aniba pilosa van der Werff, sp. nov. TYPE: Ecuador. Morona–Santiago: along road Mendez–El Limón, elev. 800 m, *van der Werff & Palacios 10430* (holotype, MO; isotypes, AAU, GB, NY, QCNE, QRS, US). Figure 4.

Arbores ad 10 m. Ramuli angulati, vetustiores teretes, dense fusco-tomentelli. Folia alterna, chartacea, 15–22 × 7–12 cm, (late) elliptica, basi obtusa vel rotundata, raro acuta, apice breviter acuminata, acumine ad 2 cm longo, supra glabra, subtus papillosa, pilosa, pilis plerumque erectis, pagina inter pilis manifesta; nervis lateralibus 8–12 utroque latere, venatione supra immersa, subtus costa nervisque elevatis, reticulatione paullo elevata. Petioli 1–2 cm longi, indumento ramulis similes. Inflorescentiae axillares, paniculatae, 10–24 cm longae, fusco-tomentellae. Pedicelli ad 1 mm longi, flores virides, fragrantes, ad 2.5 mm longi. Tepala 6, aequalia, fusco-tomentella, intus glabra, crista mediana praedita, late ovata, ca. 1 mm longa. Stamina 9, 2-locellata, 6 exteriora locellis laterali-apicalibus, filamentis quam antheris angustioribus; 3 interiora locellis extrorsis, filamentis antheris crassitudine aequantibus, glandulis duabus praeditis; omnibus filamentis lanatis. Ovarium anguste ellipsoideum, dimidio inferiore glabrum, dimidio superiore pubescens. Tubus floralis intus glaber. Cupula infundibuliformis, ad 2 cm longa; fructus ellipsoideus, 2.5 × 2 cm.

Tree, to 10 m. Twigs angular, becoming terete, densely brown-tomentellous. Terminal bud brown-tomentellous. Leaves alternate, chartaceous, 15–22 × 7–12 cm, (broadly) elliptic, the base obtuse to rounded, rarely acute, the tip shortly acuminate, the acumen to 2 cm long, but frequently broken off, upper surface glabrous, lower surface papillose, pilose, the hairs mostly erect, the leaf surface visible between the hairs; lateral veins 8–12 per side, venation immersed on upper surface, midrib and lateral veins raised on lower surface, tertiary venation weakly raised. Petioles with similar indument as twigs, 1–2 cm long, weakly canaliculate. Inflorescences in axils of leaves, paniculate, 10–24 cm long, brown-tomentellous, many-flowered. Pedicels ca. 1 mm long, gradually widened into the floral tube. Flowers green, fragrant, ca. 2.5 mm long. Tepals 6, equal, brown-tomentellous, ca. 1 mm long, broadly ovate, with a central ridge, this more pronounced on the outer 3 tepals, the margin ciliate, inner surface glabrous. Stamens 9, all 2-celled, the outer six with the cells lateral-apical, the connective protruding past the cells, the filament narrower than the anther; inner 3 stamens with cells extrorse, the filament as wide as the anther, with two rather large globose glands near the base; filaments of all stamens woolly pubescent. Ovary narrowly ellipsoid, the lower half glabrous, upper half densely pubescent, gradually narrowed into the style. Floral tube glabrous inside. Cupule funnel-shaped, thin-walled, to 2 cm long (including the swollen pedicel), usually split in 3 or 4 by the growing fruit; fruit ellipsoid, 2.5 × 2 cm.

Aniba pilosa can be readily identified by its pilose lower leaf surface. Most *Aniba* species have a (nearly) glabrous lower leaf surface; a few have a tomentellous lower leaf surface, but these species have

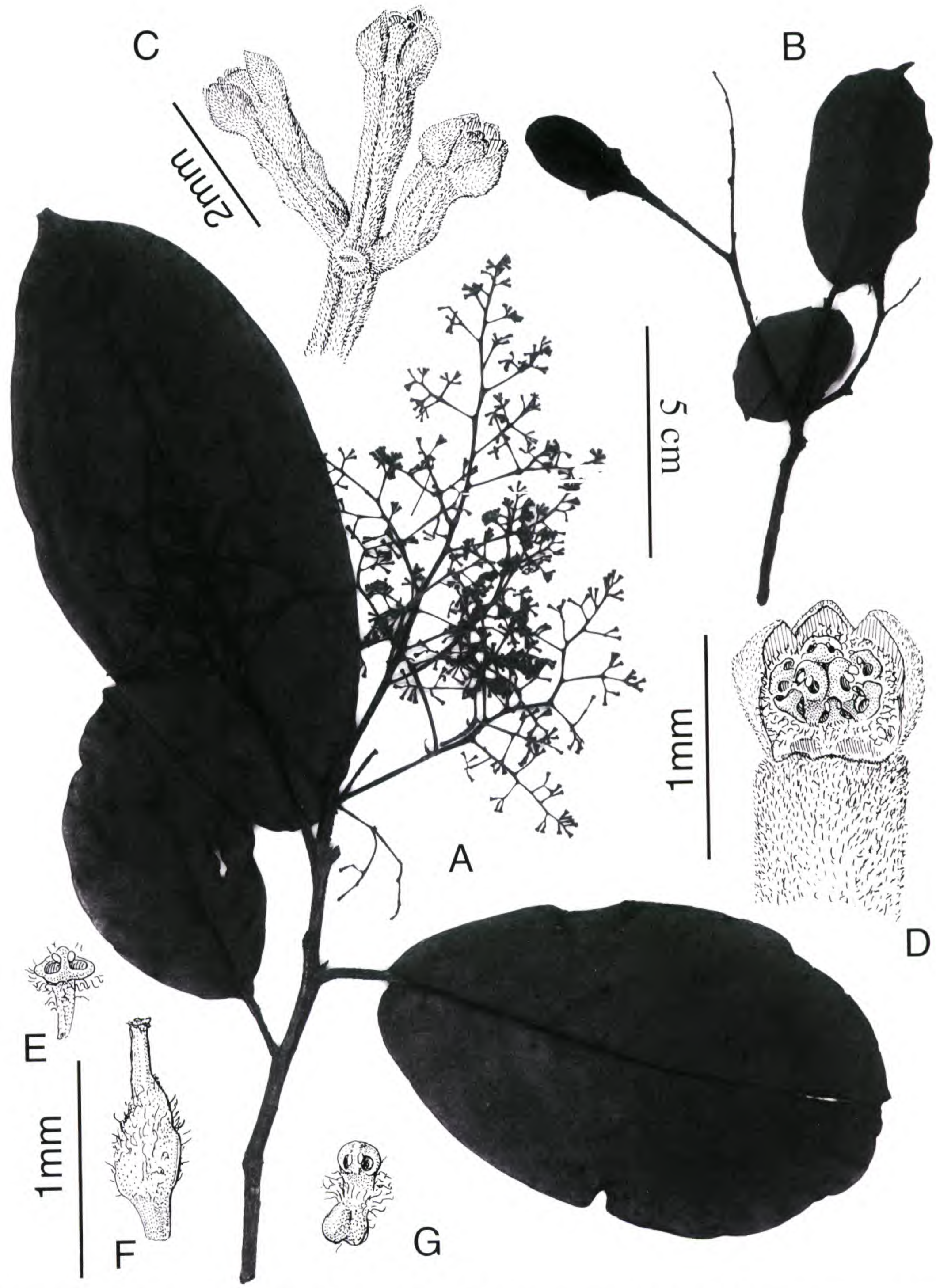

Figure 4. *Aniba pilosa* van der Werff. —A. Habit. —B. Infructescence. —C. Detail of inflorescence. —D. Flower with tepals removed. —E. Outer stamen. —F. Pistil. —G. Inner stamen.

usually clustered, not alternate leaves. In Kubitzki's (1982) key of *Aniba*, *A. pilosa* will key to *A. permollis* due to its papillose leaves and pilose indument. However, *A. permollis* has the lower leaf surface completely covered by its tomentellous-tomentose indument and the tertiary venation is not raised on the upper leaf surface; in *A. pilosa* most of the lower leaf surface is visible between the hairs and

the reticulation is weakly raised on the upper leaf surface. Moreover, *A. pilosa* has wider leaves with more rounded leaf bases. Both species have a striking, dark brown indument. Other useful characteristics of *A. pilosa* are the shape of the outer stamens, with the filament narrower than the anther and the funnel-shaped, frequently split cupules. *Aniba cinnamomiflora*, from Venezuela, has a similar cupule; it differs from *A. pilosa* in indument, in its much smaller inflorescences and in its narrower leaves.

Paratype. ECUADOR. **Morona–Santiago:** road Mendez–El Limón, tree in pasture, 500 m elev., *van der Werff & Palacios 10432* (fl) (AAU, MO, QCNE).

Aniba vulcanicola van der Werff, sp. nov. TYPE: Ecuador. Napo: Archidona, southern slope of volcano Sumaco, km 31 road Hollin–Loreto, elev. 1,200 m, tree, 15 m, Nov. 1989 (fls), *Palacios 4753* (holotype, MO; isotypes, AAU, GB, HBG, NY, QCNE, US). Figure 5.

Arbor, 15 m. Ramuli teretes, lenticellati, hornotini tomentosi, annotini glabri. Gemma terminalis tomentosa vel dense adpresse pubescens. Folia ad apices ramulorum congesta, cernua, subcoriacea, 10–25 × 5–10 cm, elliptica vel elliptico-obovata, basi et apice acuta, utrinque glabra vel perjuvenalia adpressa pubescentia, nervis lateralibus 10–14 utroque latere, in dimidio distale brochidodromis, supra costa nervisque immersis, reticulatione obscura; subtus costa nervisque elevatis, reticulatione paullo elevata. Petioli 1–2 cm longi, glabri, canaliculati. Inflorescentiae secus ramulos hornotinos ex axillis bractearum ortae, paniculatae, tomentosae, 7–15 cm longae. Pedicelli ad 2 mm longi. Tepala 6, aequalia, erecta, intus sparse pubescentia, late ovata, ca. 1.5 × 1.3 mm. Stamina 9, 2-locellata, locellis rimis vel valvis minutis aperientibus, 6 exteriora ad 1 mm longa, intro curvata, locellis lateralibus vel laterali-apicalibus, anthera quam filamento pubescente latiore; 3 interiora erecta, ca. 1 mm longa, locellis apicalibus, filamentis basi glandulis duabus praeditis. Pistillum glabrum, tenue. Receptaculum pubescens, praesertim dimidio superiore. Fructus ignotus.

Tree, 15 m. Twigs terete, lenticellate, tip brown-tomentose, older parts soon glabrous. Terminal bud densely tomentose or appressed pubescent. Leaves clustered at tips of branches, drooping, subcoriaceous, 10–25 × 5–10 cm, elliptic to elliptic-obovate, base and apex acute, glabrous on both surfaces, or very young leaves with some appressed pubescence on lower surface, lateral veins 10–14 on each side, arching upwards and brochidodromous in the distal half of lamina; costa and lateral veins immersed on upper surface with tertiary venation not visible; costa and lateral veins raised on lower surface, the tertiary venation slightly raised. Petioles 1–2 cm long, glabrous, canaliculate. Inflorescences in axils of deciduous bracts on young growth above the leaves, paniculate, brown-tomentose, 7–15 cm long. Pedicels very short, to 2 mm long. Flowers greenish, tomentose-tomentellous. Tepals 6, equal, inner surface pubescent, broadly ovate, ca. 1.5 × 1.3 mm. Stamens 9, all 2-celled, the cells opening by slits or minute valves, the outer six ca. 1 mm long, the cells lateral or lateral-apical, the outer six ca. 1 mm long, curved inward, the anther broader than the pubescent filament; inner stamens erect, ca. 1 mm long, the filaments with two globose glands near the base, the cells virtually apical. Pistil slender, glabrous. Receptacle pubescent inside, especially the upper part. Fruit unknown.

Aniba vulcanicola is related to the other *Aniba* species with large, clustered leaves, such as *A. hostmanniana* and *A. williamsii*. It differs from those species in its (nearly) glabrous leaves, relatively long petioles, tomentose inflorescences, the acute leaf bases, and the relatively few lateral veins. The peculiar, almost slitlike opening of the locelli occurs also in the related species, although these species do not have the anther cells in a nearly apical position. The related species are only known from lowlands, up to 300–400 m elevation, while *A. vulcanicola* occurs at 1,200 m elevation.

In Kubitzki's (1982) key of *Aniba*, *A. vulcanicola* will key to a group of four species with glabrous, clustered leaves and ventral-lateral locelli. From *A. bracteata* and *A. terminalis* it differs in leaf base (not abruptly rounded nor cuneate); both *A. affinis* and *A. citrifolia* have smaller, less clearly clustered leaves, lack a prominently raised midrib on the lower leaf surface, and have a sparser indument on the inflorescences.

Licaria applanata van der Werff, sp. nov. TYPE: Ecuador. Pichincha: Reserva Río Guajalito, near Chiriboga, along old road Quito–Sto. Domingo, 1,850 m, *van der Werff et al. 12194* (holotype, MO; isotypes, AAU, GB, HBG, K, NY, P, QCNE, QRS, US). Figure 6.

Arbor ad 30 m. Ramuli teretes, glabri vel minute adpresse pubescentes. Gemma terminalis albida, adpresse pubescens. Folia alterna, firme chartacea vel coriacea, 11–20 × 4–8 cm, elliptica vel late elliptica, basi acuta vel obtusa, apice acuta vel acuminata, supra nitentia, glabra, subtus glabra vel pilis parvis praedita, nervis lateralibus 5–6 utroque latere. Petioli nigri, (sub) glabri, 1 cm longi. Inflorescentiae axillares, ad 8 cm longae, subtiliter pubescentes, flores glabri, depressi, in sicco 4–5 mm diam., in alcohole conservati 6–6.5 mm diam. Tepala 6, utrinque glabra, exteriora quam interiora minora. Stamina 3, 2-locellata, locellis apicalibus, tepala versus aperientibus, plus minusve coalita, irregulariter obconica, apice plana. Staminodia 6, (late) ligulata. Glandulae magnae, staminodiis alternantes. Pistillum glabrum, receptaculo glabro. In fructu pedicelli incrassati, sensim in cupulam

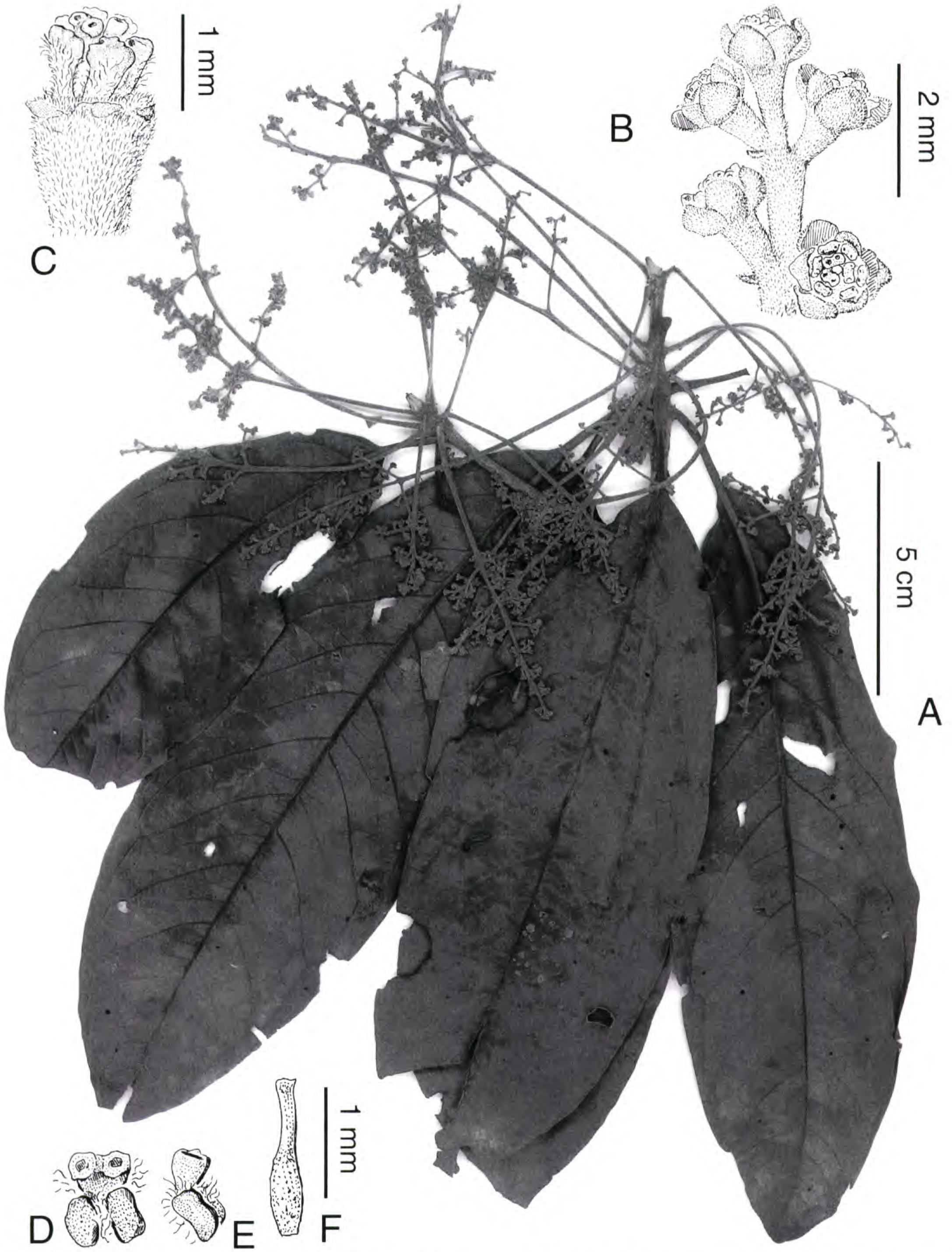

Figure 5. *Aniba vulcanicola* van der Werff. —A. Habit. —B. Detail of inflorescence. —C. Flower with tepals removed. —D, E. Inner stamen with basal glands. —F. Pistil.

dilatati, cupula 2-marginata, non profunda, fructu exserto, ellipsoideo, 2.5 × 2 cm.

Tree, to 30 m tall. Twigs terete, glabrous or finely appressed pubescent appearing pale and contrasting with the dark petioles. Terminal buds whitish, finely appressed pubescent. Leaves alternate, firmly chartaceous or coriaceous, 11–20 × 4–8 cm, elliptic to broadly elliptic, the base acute or obtuse, apex

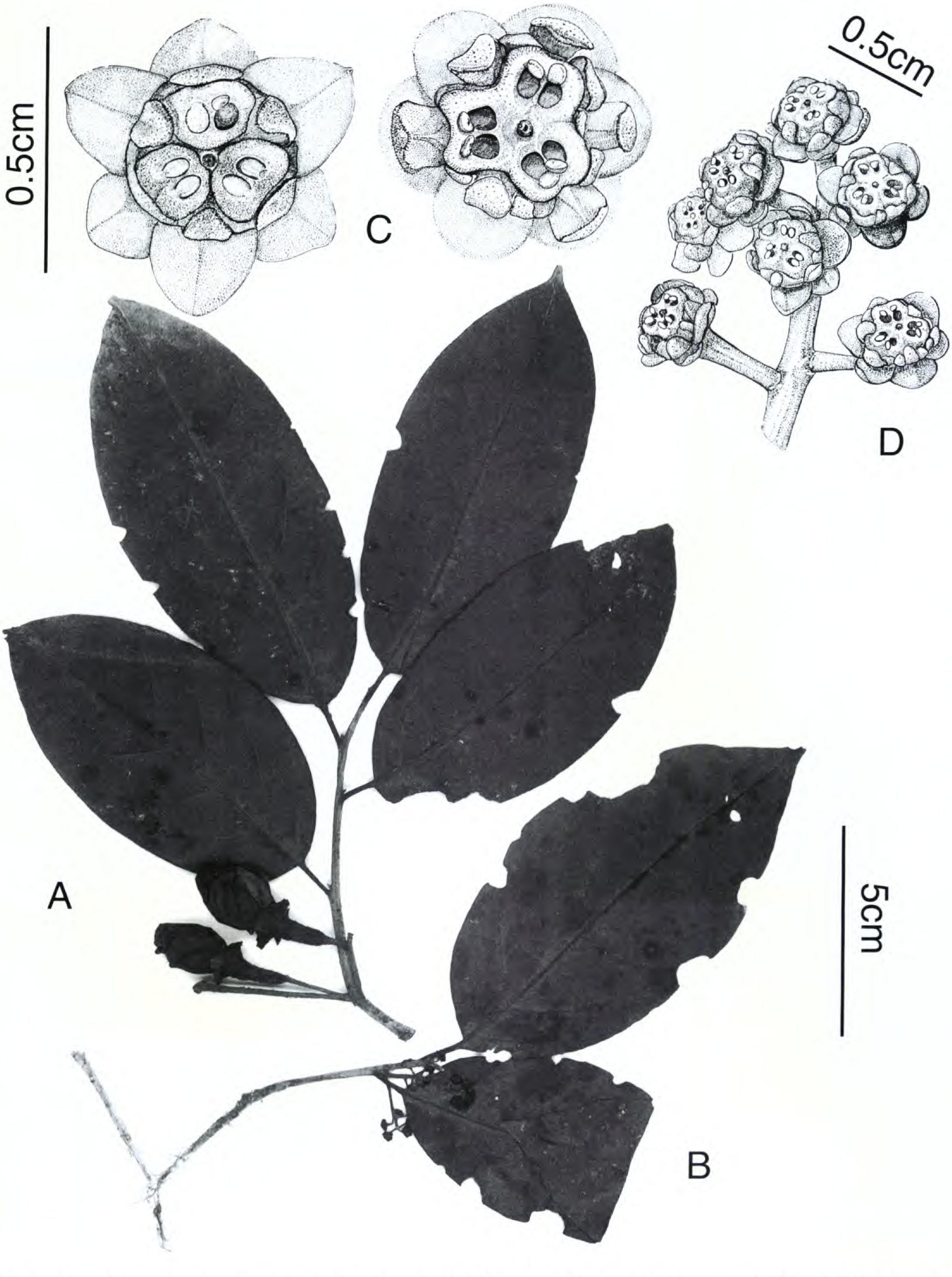

Figure 6. *Licaria applanata* van der Werff. —A, B. Habits with fruits and flowers. —C. Flowers, the younger one with staminodia pressed against stamens, the older one with spreading staminodia, showing the large glands. —D. Part of inflorescence.

acute or acuminate, the upper surface shiny and glabrous, the lower surface dull, darker green than upper surface (but see discussion), glabrous or with some scattered appressed hairs, lateral veins 5–6 on each side, immersed in upper surface, raised on lower surface. Petioles blackish, glabrous or with some appressed hairs, weakly canaliculate, ca. 1 cm long. Inflorescences in axils of bracts or normal leaves, to 8 cm long, finely pubescent, the hairs appressed or spreading. Flowers in vivo green, fragrant, in sicco black, glabrous, contrasting with the pubescent pedicels, depressed globose, 4–5 mm diam. when dry, 6–6.5 mm in pickled flowers, ca. 2 mm long. Tepals 6, glabrous on both surfaces, the outer three smaller than the inner three, almost circular, in young flowers erect, later spreading and finally recurved. Stamens and staminodes forming a pillowlike mass, ca. 4.5 mm diam. in pickled flowers. Androecium consisting of three fertile stamens, representing whorl III, each stamen with 2 apical locelli, the valves attached at the side of the locelli away from the pistil; stamens gradually narrowed toward the base, without a distinction between filament and anther; stamens tightly pressed together and appearing fused, but their margins, especially toward the center of the flower, with a row of reddish hairs; staminodia 6, representing the outer two whorls, as long as the stamens, those of whorl I broader than those of whorl II, all slightly pilose, in young flowers tightly pressed against the stamens, in old flowers bent backwards and conspicuous; glands at the base of the fertile stamens large, glabrous, about the size of the staminodia and alternating with these, glands and staminodia completely enclosing the fertile stamens. Pistil glabrous, the style exserted through a small pore between the fertile stamens, stigma minute. Receptacle glabrous inside, cupule red, shallow, without persistent stamens or staminodia, with double margin, the inner margin erect, small, the outer one spreading, 6-lobed, pedicel in fruit strongly swollen, pedicel and cupule funnel-shaped. Fruit ellipsoid, 2.5 × 2 cm, almost completely exserted, turning purple at maturity.

Licaria applanata clearly belongs to *Licaria* subg. *Armeniaca* Kurz, characterized by the locelli, which open away from the center of the flower. With exception of the common *L. armeniaca* and *L. debilis*, the species in this subgenus are rare and known from few fertile collections. *Licaria applanata* can be easily identified by the following characters: the large flowers (dried flowers 4–4.5 mm broad vs. ca. 2 mm in other species); the strongly depressed androecium (hence the epithet) with apical locelli; and asymmetrical obconic stamens which gradually widen from their base and lack a distinct filament. Other striking features are the funnel-shaped cupules and the glabrous flowers, which contrast with the pubescent pedicels. In Kurz's (1983) key *L. applanata* would key near *L. pucheri*, which has much smaller flowers and a cylindrical cupule. However, *L. applanata* has a similar floral development as Kurz described for *L. pucheri;* in young flowers tepals are erect and staminodia are tightly appressed against the stamens, while in older flowers the tepals become spreading to reflexed, the staminodia bend backwards and become free from the stamens. In old flowers the stamens separate slightly from each other, but not to the degree seen in *L. pucheri*.

The common name for this species in Napo is Ishpingo. The wood is reportedly used for making furniture. According to Palacios, the juvenile leaves have a whitish cover. A waxy cover of leaf surface generally dissolves in alcohol and is not visible in alcohol-collected specimens. However, such leaves usually have a dull, dark brown color, as has *L. applanata*. Flowers that had been collected by Jaramillo, Palacios, and van der Werff, and then pickled, provided useful material for the description. In the related species with smaller flowers the pressing and drying process is not too damaging, but after pressing and drying most of the relatively large flowers of *L. applanata* were severely distorted.

Paratypes. COLOMBIA. **Antioquia:** Mun. Caramanta, 9.8 km from Caramanta toward Supia, *Betancur et al. 1134* (fr) (MO). ECUADOR. **Napo:** near Baeza, *Little & Campuzano 10* (fr) (MO, QAME); Canton Quixos, along Río Cosanga, *Palacios 6317* (fl) (MO, QCNE), *Palacios 6355* (fl) (MO, QCNE); Baeza, upper part of Río Machángara, *Palacios & Freira 5006* (fr) (MO, QCNE); slopes of Sumaco, km 40 road Hollin–Loreto, *Jaramillo 011* (MO, QCA); Pichincha, Reserva Florística Río Guajalito, *Jaramillo 13655* (pickled flowers MO, QCA).

Mezilaurus triunca van der Werff, sp. nov. TYPE: Peru. Loreto: Maynas, Iquitos, Allpahuayo, Estación Experimental IIAP, tree, 20 m, flowers green, *Vásquez et al. 14372* (holotype, MO; isotype, AAU, AMAZ, HBG, NY, QRS). Figure 7.

Arbor, ad 25 m. Ramuli minute puberuli, pilis erectis praediti, glabrescentes, cicatribus conspicuis foliorum deciduorum ornati. Gemma terminalis dense puberula. Folia alterna, ad apices ramuloum conferta, obovata, 30–48 × 9–12 cm, chartacea, basi acuta vel cuneata, apice rotundata vel plus minusve acuta, glabra; supra venatione immersa, subtus costa perelevata, nervis elevatis et venatione tertia paullo elevata; nervis 18–24 utroque costae latere. Petioli 4–8 cm longi, basi incrassati. Inflorescentiae axillares, ad 30 cm longae, minute puberulae, duplo ra-

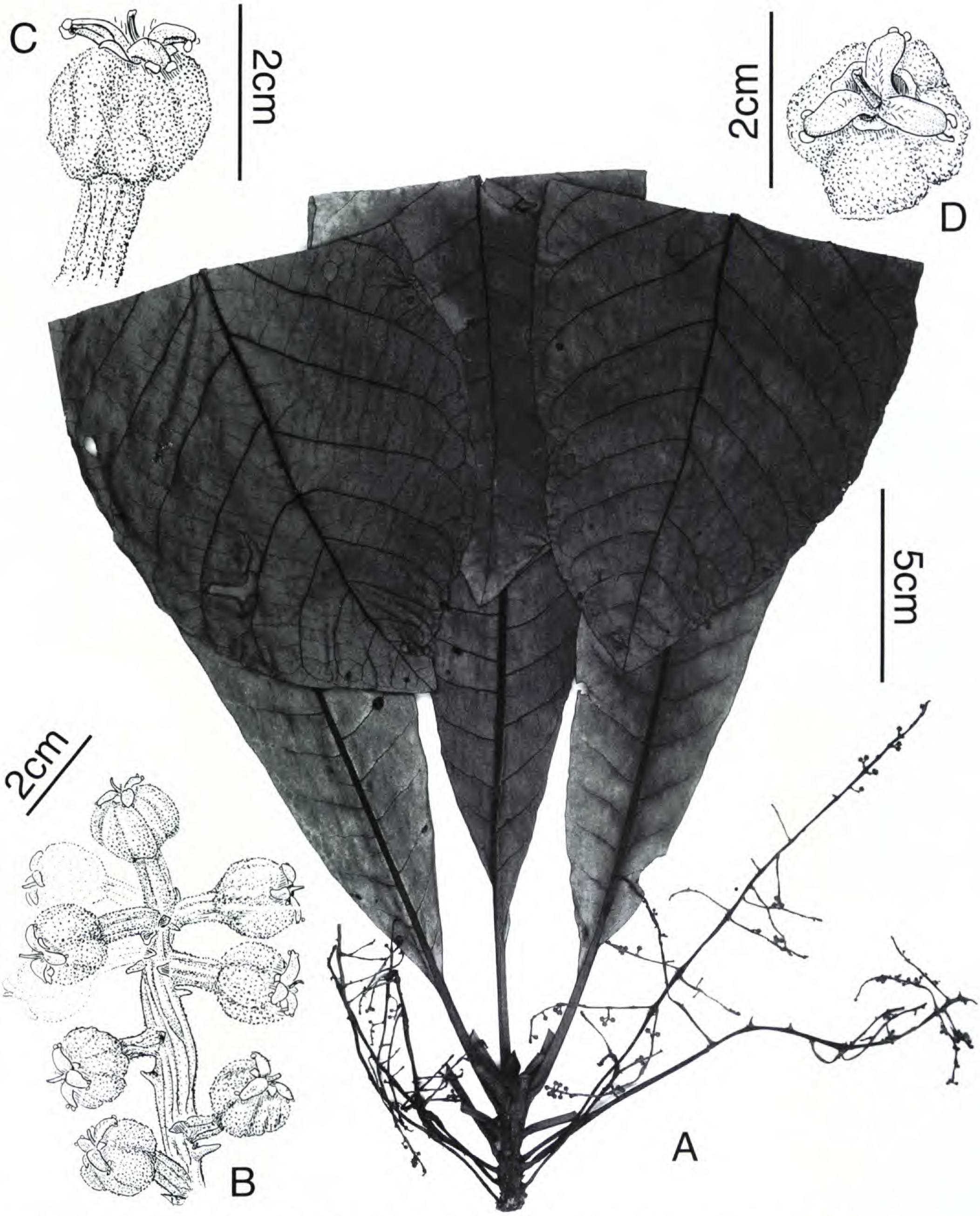

Figure 7. *Mezilaurus triunca* van der Werff. —A. Habit. —B. Detail of inflorescence. —C, D. Flower seen from aside and above.

cemosae. Flores hermaphroditi, globosi, papilloso-puberuli. Tepala 6, inaequalia, 3 exteriora quam interiora brevioria; stamina 3, 2-locellata, unciformiter exserta, filamento quam antheris latiori, ventrali pubescentia. Ovarium globosum, glabrum. Receptaculum quasi planum. Fructus ellipsoideus, ad 4 cm longus; cupula parva, plana.

Tree, to 25 m. Twigs minutely pubescent, the hairs erect, glabrescent, diameter of flowering twigs ca. 5 cm below apex 7–10 mm, the tips of twigs with conspicuous scars of fallen leaves. Terminal buds densely puberulous. Leaves alternate, clustered near the tips of branches, obovate, 30–48 × 9–12 cm, chartaceous, the base acute or cuneate, the tip bluntly acute to roundish, glabrous on both surfaces or nearly so; venation (including midrib) on upper surface immersed, midrib prominently raised on low-

er surface, lateral veins raised, and tertiary venation weakly raised on lower leaf surface; lateral veins 8–24 on each side. Petioles with flat upper side and ridged lower side, 4–8 cm long, the base swollen. Inflorescences axillary, minutely puberulous, to 30 cm long, a double (very rarely triple) raceme, the flowers arranged in sessile cymes (frequently one or two flowers of a cyme broken off). Flowers perfect, (sub) globose, papillose-pubescent, 1.5–2.0 mm diam. (rehydrated). Tepals 6, unequal, the outer three smaller than the inner three; fertile stamens 3, 2-celled, the anthers hooklike exserted, the filament broad, ventrally densely pubescent, with 2 conical glands attached slightly above the base; staminodia 9, representing whorls I, II, and IV, stipitate, pubescent. Ovary globose, glabrous, 0.4 mm diam., style slender, 0.8 mm long. Receptacle shallow, glabrous. Fruit ellipsoid, green with white dots, to 4 cm long, seated on a very small, flat cupule.

Flowers: August–September; fruits May (immature), August.

Mezilaurus triunca is a very striking, but unusual, Lauracea due to its large leaves clustered at the tips of the branches, its long petioles with a swollen base and its hooklike exserted stamens. The three fertile 2-celled stamens, the small cupule, and the clustered leaves place this species in *Mezilaurus*. Only one other species, *M. mahuba* (Sampaio) van der Werff, has similar hooklike anthers. This species is the type species of the genus *Clinostemon*, but was recently transferred to *Mezilaurus* (van der Werff, 1987). *Mezilaurus triunca* differs from *M. mahuba* by its longer petioles (2–3 cm long in *M. mahuba*, 4–9 cm in *M. triunca*), glabrous lower leaf surface (*M. mahuba* has an indument of short, erect hairs) and distribution (*M. mahuba* is restricted to varzea forest in Pará and Amapa, Brazil; *M. triunca* occurs in terra firme forest near Iquitos, Peru). In mature flowers with exserted anthers it is difficult to see that the tepals are unequal. In young flowers with erect anthers still included in the flower the difference in size between inner and outer tepals is quite obvious, with the outer tepals less than half the size of the inner ones.

Kubitzki et al. (1979) reinstated the genus *Clinostemon* and placed two species, *C. mahuba* (Sampaio) Kuhlmann & Sampaio and *C. maguireanum* (Allen) Kurz, in it. They indicated the following differences between *Clinostemon* and *Mezilaurus:* staminodes present, stamens erect or bent downward, with or without glands, leaves hirsute beneath—*Clinostemon;* versus staminodes absent, stamens erect, without glands, leaves glabrous or hirsute—*Mezilaurus*. *Mezilaurus triunca* agrees in all important characters with *M. mahuba* (presence of staminodes and staminal glands, recurved anthers). One might argue for the recognition of *Clinostemon* as a distinct genus based on these characters, but some *Mezilaurus* species with erect stamens (*M. thoroflora*, *M. pyriflora*, and *M. duckei*) also have staminodes (6, not 9 as in *M. mahuba* and *M. triunca*). These three species are very similar to other *Mezilaurus* species in wood anatomy (Kubitzki et al., 1979). Thus, recognition of *Clinostemon* would be based only on the shape of anthers, the presence of 9, not 6 or 0, staminodes and the presence of staminal glands. In my opinion, this combination of characters is insufficient for the recognition of a separate genus, and I continue to consider *Clinostemon* a synonym of *Mezilaurus*.

Paratypes. PERU. **Loreto:** Maynas, Allpahuayo, *Gentry et al. 56468* (st) (MO), *Gentry et al. 65863* (st) (MO), *Pipoly et al. 12230* (fl) (MO), *van der Werff et al. 10227* (fr) (AAU, AMAZ, HBG, MO, QRS). **Maynas:** Santa Maria de Nanay, *Vásquez & Jaramillo 12231* (fr) (AMAZ, MO).

Ocotea rugosa van der Werff, sp. nov. TYPE: Ecuador. Bolívar: in small patches of disturbed cloud forest along first 15 km of road Chillanes–El Tambo, elev. 2,400 m, *van der Werff et al. 12429* (male fl) (holotype, MO; isotypes, AAU, GB, NY, QCNE, QRS, US). Figure 8.

Arbor dioica. Ramuli juniores tomentelli, vetustiores glabrescentes. Gemma terminalis tomentella. Folia alterna, elliptica vel elliptico-obovata, 12–24 × 6–14 cm, chartacea vel subcoriacea, rugosa, basi acuta vel obtusa, apice acuta vel breviter acuminata, supra glabra (juvenalia pubescentia), subtus pilis erectis praedita; venatione supra impressa, subtus insigniter elevata; nervis lateralibus 9–12 utroque costae latere, venatione brochidodroma. Petioli ca. 1 cm longi. Inflorescentiae axillares, paniculatae, ad 30 cm longae, sparse vel modice pubescentes. Flores unisexuales, subglabri vel pubescentes; tepala 6, aequalia, ca. 2 mm longa, intus glabra, margine plus minusve papillosa, in flore staminato stamina 9, 4-locellata, 6 exteriora introrsa, 3 interiora laterali-extrorsa, basi glandulis magnis praedita; staminodia nulla, pistillodium praesens, quam staminibus interioribus brevior; in flore pistillato staminodia 9, 3 interioribus basi glandulis duabus praeditis, pistillum ca. 2 mm longum, stigmate discoidea. Cupula parva, plana, pedicello incrassato; fructus ellipsoideus, omnino exsertus, 15 × 7 mm.

Small to medium-sized dioecious trees. Twigs terete or weakly ridged, the young parts tomentellous, but glabrescent with age. Terminal bud densely brown-tomentellous. Leaves alternate, evenly distributed along twigs, elliptic to elliptic-obovate, 12–24 × 6–10 cm, chartaceous to subcoriaceous, rugose, base acute or obtuse, apex shortly acuminate or acute, upper surface glabrous or, when young,

Figure 8. *Ocotea rugosa* van der Werff. —A. Habit. —B. Infructescence. —C, D. Flowers seen from above and aside. —E. Pistil. —F. Outer stamen. —G, H. Inner stamen.

with some erect or appressed hairs, these much denser and becoming tomentellous near the base and along midrib and major secondaries, lower surface with short, erect hairs, these denser along midrib and major veins; secondary and tertiary venation impressed on upper surface and, together with midrib, prominently loop-connected in distal two-thirds of lamina. Petioles ca. 1 cm long. Inflorescences axillary, to 30 cm long, paniculate, sparsely to moderately pubescent with erect hairs, the flowers in

rather dense clusters. Flowers unisexual, subglabrous outside; tepals 6, equal, ca. 2 mm long, the inner surface glabrous or the margin papillose; male flowers with nine 4-celled stamens, the outer six with introrse cells, glabrous, the filaments very short, the inner three with lateral-extrorse cells, with two large glands at the base of the filaments of inner stamens; staminodia lacking; pistillode present, but shorter than the inner stamens; female flowers with nine small staminodia, glands present at base of inner staminodia, pistil ca. 2 mm long, glabrous, ovary as long as the style, stigma platelike, receptacle glabrous. In old flowers tepals frequently united at the base and falling as a unit. Cupule small, platelike, scarcely separated from the swollen pedicel, the fruit completely exserted, ellipsoid, 15 × 7 mm.

Altitudinal range: 1,800–2,600 m.

Flowers: July–September, fruits July–December.

Ocotea rugosa is only known from montane forests on the western side of the Andes in central Ecuador. The small cupule, swollen pedicel in fruit, and the relatively long, narrow fruits indicate a placement in the *Ocotea minarum* group. The erect pubescence on the lower leaf surface and lack of a wax coating of the lower leaf surface point to *O. ovalifolia* (Ruiz & Pavón) Mez as the closest relative. *Ocotea rugosa* differs from that species in its rugose leaves with the venation impressed on the upper and raised on the lower leaf surface, in the loop-connected lateral veins, and the glabrous inner surface of the tepals. The leaf base of *O. ovalifolia* is usually inrolled and decurrent (plane in *O. rugosa*), and *O. ovalifolia* has also a much denser indument on inflorescences and flowers. *Ocotea oocarpa* Mez & Sodiro, only known from the Ecuadorian Andes at ± 2,000 m elevation, has been placed in the *O. minarum* group, as well (Rohwer, 1986). This species differs from *O. rugosa* in having appressed, not erect hairs on the leaves and in not having its reticulation prominently raised.

The dioecious condition is not always obvious in *O. rugosa*. In the pistillate flowers there is no doubt that the staminodia are not functional, but in staminate flowers the pistillode is relatively well developed; however, a dissection shows that an ovule is lacking. Pickled staminate flowers show clearly that the pistillode remains hidden between the inner three stamens and is not accessible to pollinators.

Paratypes. ECUADOR. **Bolívar:** along road Chillanes–El Tambo, *van der Werff et al. 12436* (female fl, young fr) (MO, QCNE), *van der Werff et al. 12496* (young fr) (AAU, MO, QCNE, QRS). **Pichincha:** Reserva Florístico Río Guajalito near Chiriboga, *van der Werff et al. 12216* (fr) (MO, QCNE, QRS), *Zak & Jaramillo 595* (fr) (AAU, MO, QCA, QRS); without indication of province, but probably Bolívar: Balsapampa, W of Guaranda, *Rimbach 203* (female fl) (MAD), *790* (MAD), *Rimbach 827* (fr) (MAD), *Rimbach 245* (male fl) (MAD).

Persea fendleri van der Werff, sp. nov. TYPE: Venezuela. Aragua: P. N. Henri Pittier, *Steyermark 91412* (fl) (holotype, NY). Figure 9.

Arbor, ad 15 m. Ramuli teretes, juvenales adpresse pubescentes, vetustiores glabrescentes. Gemma terminalis dense albido-pubescens. Folia alterna, chartacea, 7.5–12 × 2.5–4.5 cm, elliptica, basi acuta vel attenuata, apice acuta, nervis lateralibus 7–10 utroque latere, supra glabra, costa impressa, nervis immersis, subtus costa nervisque elevatis, utrinque tenuiter reticulata. Petioli 1.5–2.5 cm longi. Inflorescentiae axillares, ad 5 cm longae, adpresse pubescentes. Flores virides. Tepala 6, (sub) aequalia, utrinque pubescentes, 2.5–3.0 mm longa; stamina 9, 4-locellata, 6 exteriora ca. 1.5 mm longa, locellis introrsis, filamentis pubescentibus antheris glabris; 3 interiora ad 2 mm longa, locellis extrorso-lateralibus, filamentis glandulis duobus praeditis; staminodia 3, ca. 1 mm longa, apice triangulari. Pistillum glabrum, ca. 2 mm longum, ovario globoso, 1 mm diametro. Fructus globosus, 1 cm diametro, basi tepalis persistentibus ornatus.

Tree, to 15 m tall. Twigs terete or slightly ridged, the young parts appressed pubescent, but soon becoming glabrous. Terminal bud densely white-pubescent. Leaves alternate, chartaceous, 7.5–12 × 2.5–4.5 cm, elliptic, base acute or attenuate, tip acute, lateral veins 7–10, arching upwards and fading out near the margin, upper surface glabrous, midrib impressed, especially in lower half of lamina, lateral veins immersed, the fine tertiary, reticulate venation raised; midrib raised on lower surface, lateral veins and fine reticulation weakly raised. Petioles slender, 1.5–2.5 cm long, with varying amount of appressed pubescence. Inflorescences axillary, ca. 5 cm long, the lateral branchlets once cymosely branched or flowers racemose, appressed pubescent, especially toward the flowers, bracts usually deciduous, if present linear, to 3 mm long. Flowers greenish. Tepals 6, equal or nearly so, pubescent on both surfaces, 2.5–3.0 mm long, broadly ovate; stamens 9, all 4-celled, the outer six ca. 1.5 mm long, with introrse cells, filaments pubescent, anthers glabrous, inner three to 2 mm long, with extrorse-lateral cells, filament pubescent, with two stalked glands near the base, anther glabrous; staminodia 3, ca. 1 mm long, the tip triangular, dorsally pubescent. Pistil glabrous, ca. 2 mm long, ovary globose, 1 mm diam., rather abruptly narrowed into the style. Fruit globose, 1 cm diam., the tepals persistent at the base.

Persea fendleri belongs to a rather small group of *Persea* species characterized by equal or subequal tepals that are pubescent on the inner surface and

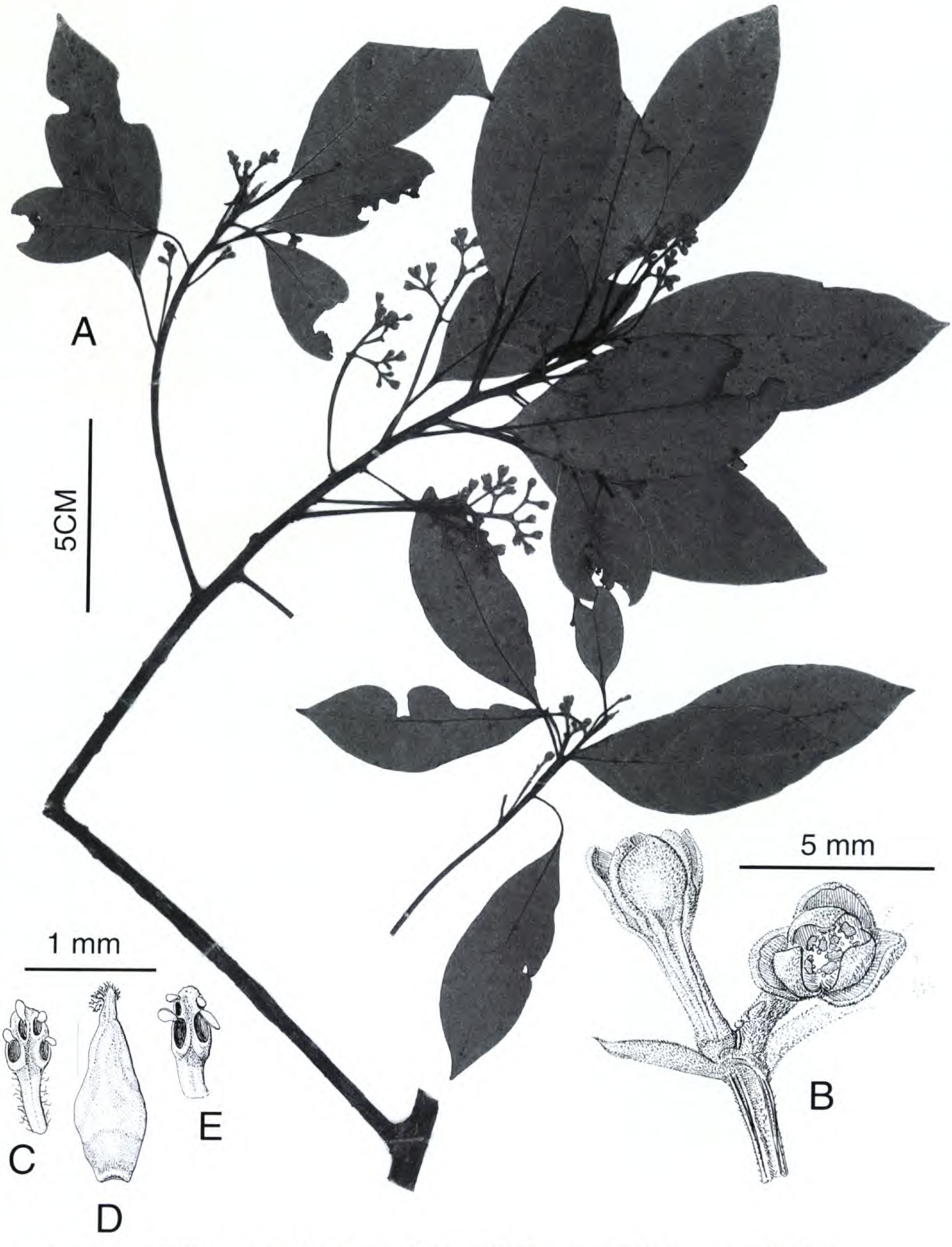

Figure 9. *Persea fendleri* van der Werff. —A. Habit. —B. Flowers. —C, E. Stamen. —D. Pistil.

persistent in the fruiting stage. This group cannot readily be placed in the infrageneric classification of *Persea* proposed by Kopp (1966), and the species usually have been treated as anomalous. Within this group, two growth forms can be recognized. In one the lateral branches of the twigs are alternate; *P. fendleri* belongs to this group. In the other group, the lateral branches are whorled; usually three or four branches sprout from the same place. Usually the terminal bud is strongly swollen in this group of species and the leaves are more or less clustered near the tips of the branches.

Persea fendleri is an inconspicuous species, characterized by its chartaceous, small leaves, short inflorescences, and a rather sparse indument. The relatively long petioles, impressed midrib, and the fine reticulation on the upper leaf surface are characters shared with other species in this group. *Persea fendleri* is similar to some Old World *Persea* species and the Fendler collection was cited by Meissner (1864) as *P. indica* (L.) Sprengel, a species otherwise known from the Canary Islands. This Fendler collection is not cited in later revisions (Mez, 1889; Kopp, 1966). *Persea indica* differs from *P. fendleri* in its more densely pubescent flowers and leaves and it its larger tepals (2.5–3.0 vs. 4–5 mm).

Persea fendleri is only known from the Cordillera de la Costa in Venezuela. There is a second, as yet undescribed species of *Persea* present in the coastal mountains of Venezuela. This species has larger, more coriaceous leaves, clustered leaves, and whorled branching. One collection of it was included in *P. rigens* Allen by Kopp (1966); a second, later collection is also in fruit. The fruits are depressed globose, not round as in *P. fendleri*. For the proper disposition of this species flowering collections are needed.

The collection *Luteyn et al. 8326* was distributed as *Nectandra steyermarkii* Allen.

Paratypes. VENEZUELA. Prope Coloniam Tovar, *Fendler 1096* (fr) (MO); border of Distr. Federal and Aragua, along road to Pto. Maya, *Luteyn et al. 8326* (fl) (MO, NY).

Persea nudigemma van der Werff, sp. nov. TYPE: Ecuador. Napo: Archidona, km 40 road Hollin–Loreto, tree, 20 m, *Palacios & Iguago 4587* (fl) (holotype, MO; isotypes, AAU, GB, HBG, NY, QCNE, US). Figure 10.

Arbores ad 30 m. Ramuli teretes, glabri, ad apicem incrassati. Gemma terminalis parva, glabra. Folia alterna, ad apices ramulorum congesta, rigide chartacea, 8–18 × 3.5–7.5 cm, elliptica, basi apiceque acuta, subtus glauca, nervis lateralibus 8–10, supra glabra, costa nervisque immersis, reticulatione paullo elevata, subtus glabra, costa, nervis, reticulatione paullo elevatis. Petioli plani, glabri; 10–17 mm longi. Inflorescentiae ex axillis foliorum vel bractearum ortae, basi cicatricibus bractearum praeditae, paniculatae, puberulae, indumento flores versus densiore, ad 14 cm longae. Tepala 6, aequalia vel exteriora interioribus paullo breviora, 3–4 mm longa, omnia utrinque pubescentia. Stamina 9, 4-locellata, 6 exteriora locellis introrsis, filamentis ca. 1.5 mm longis, pubescentibus, antheris glabris, filamentis paullo latioribus, ca. 1 mm longis; 3 interiora ca. 2.6 mm longa, locellis lateralibus, filamentis dense pubescentibus, basim versus dilatatis, glandulis super basim affixis; staminodia 3, ca. 1.5 mm longa, dorsaliter pubescentia, apice triangularia. Pistillum 3 mm longum, stylo ovarium globosum aequante. Fructus ignotus.

Tree, to 30 m. Twigs slightly angled or terete, glabrous, swollen near the tip. Terminal buds small, glabrous. Leaves alternate, clustered near the tips of branches, the margins plane, stiffly chartaceous, 8–18 × 3.5–7.5 cm, elliptic, base acute, rarely obtuse, apex acute, the lower surface glaucous, lateral veins 8–10, upper surface glabrous, costa and lateral veins immersed, fine reticulation slightly raised, lower surface glabrous, with costa, veins, and reticulation slightly raised. Petioles flat, glabrous, 10–17 mm long. Inflorescences in axils of leaves or deciduous bracts, at the base with several scars of bracts, paniculate, the lateral branches once or twice cymosely branched, puberulous, more densely so toward flowers, to 14 cm long. Flowers yellowish. Tepals 6, ovate, equal or outer three slightly shorter, 3–4 mm long, erect at anthesis, pubescent on both surfaces. Stamens 9, all 4-celled, the outer six with introrse cells, the filaments ca. 1.5 mm long, pubescent, the anther slightly wider than the filament, glabrous, ca. 1.6 mm long; inner three stamens with lateral cells, ca. 2.6 mm long, filaments densely pubescent, widened toward the base, the glands attached slightly above the base; staminodia 3, ca. 1.5 mm long, dorsally pubescent, the tip triangular. Pistil 3 mm long, style as long as the globose ovary, this with a few hairs. Fruits unknown.

Persea nudigemma belongs to a small group of neotropical *Persea* species with equal tepals, these pubescent on both surfaces and persistent in the fruiting stage, swollen tips of branches, and more or less clustered leaves. Other members of this group are *P. rigens* Allen, *P. silvatica* van der Werff, *P. bernardii* Kopp, and possibly *P. cuatrecasasii* Kostermans. The latter two species have been described as having tomentose lower leaf surfaces; *P. silvatica* has very sparsely pubescent flowers, with the indument scarcely visible to the naked eye, while the indument on flowers of *P. rigens* is clearly visible. *Persea rigens* is a poorly known species; the type collection has only buds and the paratype has an infructescence, but no fruits. Kopp (1966) cited several fruiting collections under *P. rigens*, but did not describe the fruits. Some of these fruits were strikingly depressed globose (*Steyermark 62459*) and for lack of other distinct characters this fruit shape has become associated with *P. rigens* (Burger & van der Werff, 1990). However, collections from the type region (*Croat 26475*, *Stern & Chambers 56*, both MO) show that *P. rigens* has globose fruits. Thus, *P. rigens* remains an ill-defined taxon; the collections cited by Kopp (1966) from Guatemala, Venezuela, and Ecuador very likely do not belong here. *Persea nudigemma* differs from *P. rigens* in having glaucous lower leaf surfaces and in having

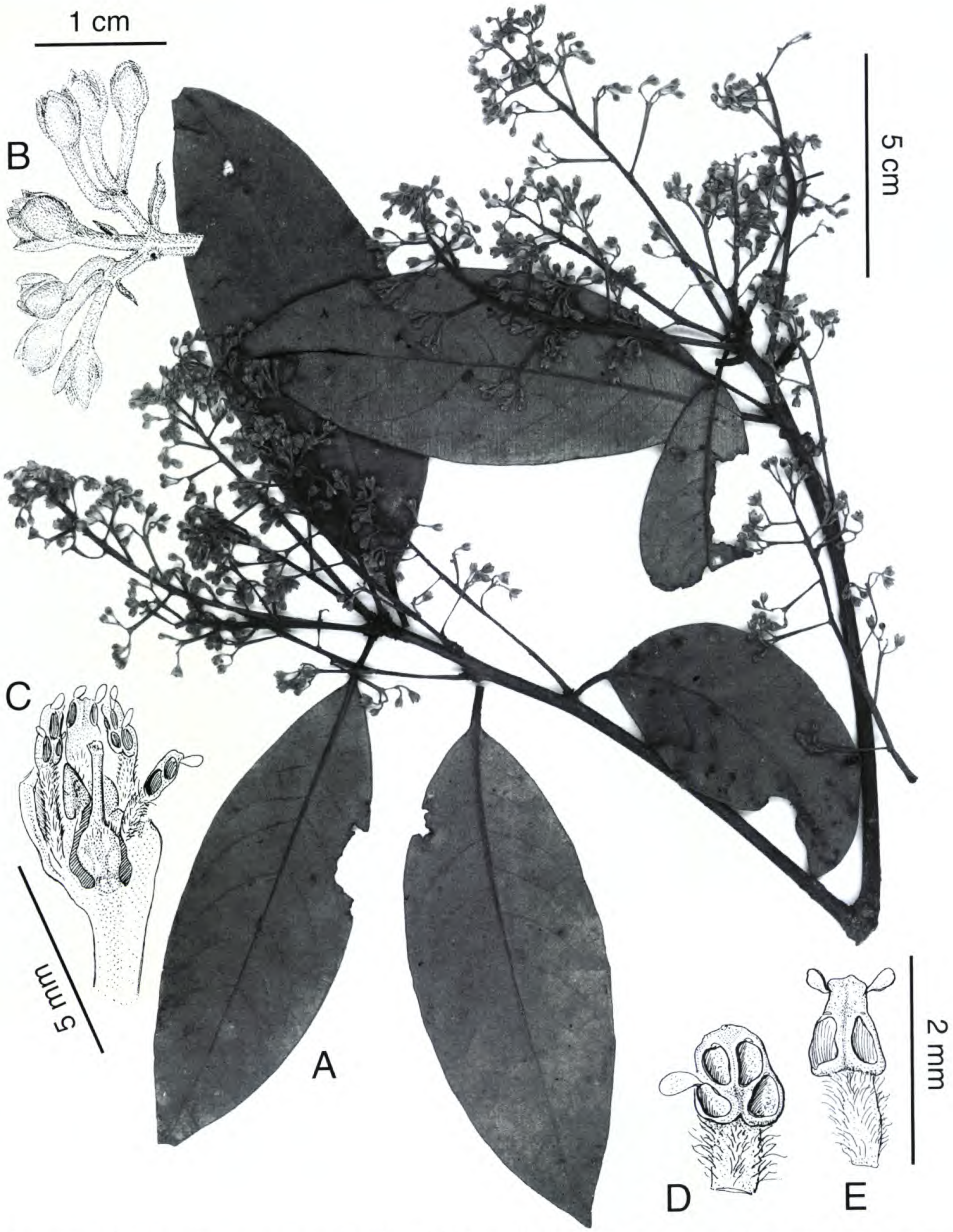

Figure 10. *Persea nudigemma* van der Werff. —A. Habit. —B. Part of inflorescence. —C. Flower in cross section. —D, E. Stamens.

less pubescent inflorescences and flowers. A sterile collection from Ecuador (Napo, km 2 carretera Cotundo–Coca, *Dodson et al. 15099*, MO) very likely belongs to *P. nudigemma*, as well.

Recent collections indicate that this group of *Persea* species is also present in Colombia and Peru. *Persea rufescens* Lundell, which is not well known to me, belongs to this species group.

Paratypes. ECUADOR. **Napo:** Archidona, km 40 road Hollin–Loreto, *Palacios & Iguago 4581* (fls) (MO, QCNE), *Neill et al. 9064* (fls) (MO, QCNE); Napo, Archidona, km 50 road Hollin–Loreto, *Palacios 4207* (fls) (MO, QCNE).

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Literature Cited

Burger, W. & H. van der Werff. 1990. Lauraceae. *In:* W. Burger (editor), Flora Costaricensis. Fieldiana, Bot. n.s. 23: 1–129.

Kopp, L. E. 1966. A taxonomic revision of the genus *Persea* in the western hemisphere. Mem. New York Bot. Gard. 14: 1–117.

Kubitzki, K. 1982. *Aniba. In:* Flora Neotropica 31: 1–84.

———, H. Kurz & H. G. Richter. 1979. Reinstatement of *Clinostemon* (Lauraceae). J. Arnold Arbor. 60: 515–522.

Kurz, H. 1983. Fortpflanzungsbiologie einiger Gattungen neotropischer Lauraceen und Revision der Gattung *Licaria* (Lauraceae). Thesis, Univ. Hamburg.

Meissner, C. F. 1864. Lauraceae. *In:* A. de Candolle (editor), Prodromus Systematis Naturalis Regni Vegetabilis 15(1): 1–260.

Mez, C. 1889. Lauraceae Americanae. Jahrb. Koenigl. Bot. Gart. Berlin 5: 1–556.

Renner, S. 1982. *Aiouea. In:* Flora Neotropica 31: 85–116.

Rohwer, J. G. 1986. Prodromus einer Monographie der Gattung *Ocotea* Aublet (Lauraceae). Mitt. Inst. Allg. Bot. Hamburg 20: 1–278.

Werff, H. van der. 1987. A revision of *Mezilaurus* (Lauraceae). Ann. Missouri Bot. Gard. 74: 153–182.

New Names in North American *Myosurus* (Ranunculaceae)

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ABSTRACT. The name *Myosurus aristatus* Bentham is illegitimate, and the North American material often treated as *M. aristatus* is conspecific with *M. apetalus* Gay of Chile. The name *Myosurus apetalus* var. *borealis* Whittemore is described for the North American taxon previously treated as *M. aristatus* subsp. *aristatus*, and the new combination *M. apetalus* var. *montanus* (G. R. Campbell) Whittemore is made for the taxon previously treated as *M. aristatus* subsp. *montanus* (G. R. Campbell) D. E. Stone.

The genus *Myosurus* L. (Ranunculaceae) consists of ca. 15 species found in temperate regions of both hemispheres (Mabberley, 1993). The genus is often considered taxonomically difficult, since the plants are predominantly self-fertilizing and interspecific hybridization is not uncommon (Stone, 1959). However, the North American species are relatively well understood, due largely to the work of Stone (1957, 1959, 1960).

One of the North American species has commonly been known under the name *Myosurus aristatus* Bentham (Campbell, 1952; Davis, 1952; Dorn, 1984, 1992; Hitchcock & Cronquist, 1964; Kearney & Peebles, 1964; Munz & Keck, 1959). However, this name is illegitimate, having been published originally as an avowed substitute for the legitimate name *M. apetalus* Gay (type from Chile). The North and South American plants have been considered conspecific by Lourteig (1951), Raven (1963), Weber & Wittmann (1992), and Wilken (1993). Stone (1957, 1960) recognized two subspecies, *M. aristatus* subsp. *aristatus* and *M. aristatus* subsp. *montanus* (G. R. Campbell) D. E. Stone, differing in characters of the sepals and fruiting heads. However, names for these taxa in *M. apetalus* have never been published.

Campbell (1952) considered *M. apetalus* to be a purely South American species and listed five supposed differences between it and *M. aristatus* of North America: achenes more than 50 per head in *M. apetalus*, fewer than 50 in *M. aristatus;* achene beaks 0.5 mm long in *M. apetalus*, 1–1.5 mm in *M. aristatus;* scapes only slightly exceed leaves in *M. apetalus*, 2–3 times longer in *M. aristatus;* sepals 3–5-nerved in *M. apetalus*, 1-nerved in *M. aristatus;* sepals retained on fruiting spikes in *M. apetalus*, shed after anthesis in *M. aristatus*. However, Campbell had little material from South America, and apparently the revision of the South American species by Lourteig (1951) was not available at the time of Campbell's study. The plants are more variable than Campbell indicated. The number of achenes per head varies from 15 to 100 in South American material; sepals in the South American plant may be either retained on the fruiting spikes or shed after anthesis; the achene beaks vary from 0.2 to 0.9 mm long, 0.3–0.9 times as long as the achene body, in the South American plant, while they are usually longer (0.6–1.4 mm long, 0.5–1.0 times as long as the achene body) in North American material; the scapes at most slightly exceed the leaves in South American specimens, while they are often, but not always, longer in North America; the sepals are 3–5-nerved in the South American plant, similar to sepals of the North American *M. aristatus* subsp. *montanus* but unlike the strongly 1-nerved sepals of *M. aristatus* subsp. *aristatus* sensu Stone. Since none of the differences between North and South American material are absolute, but all overlap, I agree with Lourteig (1951), Raven (1963), Weber & Wittmann (1992), and Wilken (1993) that they are best considered conspecific. However, since several characters show different (though overlapping) ranges of variation on the two continents, separation of the species into varieties seems appropriate.

These taxa have been fully described and illustrated by Lourteig (1951), Campbell (1952), and Stone (1957), and a full treatment of the genus in North America north of Mexico will be published (Whittemore, in press). However, the necessary nomenclature must first be validated.

Myosurus apetalus Gay, Fl. Chil. 1: 31. 1845.
Myosurus aristatus Bentham ex Hooker f. London J. Bot. 6: 458. 1847, illegitimate, earlier name included. TYPE: Chile. Prov. de Coquimbo, damp places in the Cordilleras de las Patos, elev. 11,200 ft., *C. Gay* (no longer extant?).

Key to Varieties

1a. Sepals 1-nerved; outer faces of achenes narrowly elliptical or rectangular ..... 3. *M. apetalus* var. *borealis* Whittemore

1b. Sepals 3(–5)-nerved; outer faces of achenes narrowly rhombic or elliptical.

2a. Achene beaks 0.2–0.9 mm long, 0.3–0.9 times as long as achene body; heads of achenes 2.5–18 mm long, not or scarcely exserted beyond the leaves; sepals often persisting on fruiting heads ..... 1. *M. apetalus* var. *apetalus*

2b. Achene beaks 0.6–1.4 mm long, 0.5–1.0 times as long as achene body; heads of achenes 12–24 mm long, usually exserted well beyond the leaves; sepals never persisting on fruiting heads ..... 2. *M. apetalus* var. *montanus* (G. R. Campbell) Whittemore

1. Myosurus apetalus Gay var. **apetalus.**

Distribution: Argentina (Chubut, Neuquén, Patagonia, Río Negro), Chile (Coquimbo, Magallanes, Santiago). Lourteig (1951: 558–560) described and illustrated *M. apetalus* var. *apetalus* and provided full synonymy and specimen citations.

2. Myosurus apetalus var. **montanus** (G. R. Campbell) Whittemore, comb. nov. Basionym: *Myosurus minimus* subsp. *montanus* G. R. Campbell, Aliso 2: 394. 1952. *Myosurus aristatus* subsp. *montanus* (G. R. Campbell) D. E. Stone in H. Mason, Flora of the Marshes of California: 503. 1957. TYPE: U.S.A. California: Mono County, 3 mi. NW of Bridgeport, *P. A. Munz 11811* (holotype, RSA not seen; isotype, CAS).

Distribution: Canada (Saskatchewan), United States (Arizona, California, Colorado, Montana, Nevada, North Dakota, Oregon, Utah, Wyoming). This taxon was described and illustrated by Stone (1957: 500–503, as *M. aristatus* subsp. *montanus*) and Campbell (1952: 394–395, 402–403, as *M. minimus* subsp. *montanus*); Campbell (1952) also provided specimen citations.

3. Myosurus apetalus var. **borealis** Whittemore, var. nov. TYPE: U.S.A. Idaho: Canyon County, Falks Store, beneath the sagebrush, benches, 22 Apr. 1911, *J. F. Macbride 766* (holotype, MO; isotypes, CAS, UC; according to Campbell, 1952, further isotypes (not seen) are deposited at GH and POM).

Myosurus aristatus of North American authors, not of Bentham ex Hooker f., nom. illegit.

Sepala 1-nervata; capitula acheniorum 4–9 mm; superficies exterior acheniorium anguste elliptica vel rectangularis; rostra acheniorum 0.6–1.2 mm longa, rostra corpus 0.5–1.0 plo longiora.

Sepals 1-nerved with broad scarious margins; heads of achenes 4–9 mm; scapes often much longer than leaves; outer face of achene narrowly elliptical or rectangular; achene beaks 0.6–1.2 mm long, 0.5–1.0 times as long as achene body.

This taxon was described and illustrated by Stone (1957: 500–503, as *M. aristatus* subsp. *aristatus*) and Campbell (1952: 399–400, 402–403, as *M. aristatus*). Campbell (1952) also provided further specimen citations.

Paratypes. CANADA. **British Columbia:** 2–3 mi. E of Oliver, *McCabe 5834* (UC). U.S.A. **California:** Lassen Co., *Williams et al. 86-38-3* (CAS); Modoc Co., *Bethel 25 April 1923* (CAS), *Balls 14693* (CAS); Mono Co., *Breedlove et al. 62756* (CAS); San Bernardino Co., *Peirson 4557* (CAS). **Idaho:** Bannock Co., *Cronquist 2248* (MO); Custer Co., *Hitchcock & Muhlick 9415* (CAS, MO); Elmore Co., *Grimes et al. 1500* (CAS); Franklin Co., *Anderson 1330* (CAS); Nez Perce Co., *Heller & Heller 2960* (MO, UC), *Sandberg May 1892* (MO, UC), *Sandberg et al. 159* (CAS, MO); Washington Co., *Jones 6149* (CAS, MO). **Montana:** Missoula Co., *Barkley 2667* (MO), *Demorest 21* (CAS, MO), *Hitchcock 1561* (CAS), *Keilman 3* (MO), *Kirkwood 1109* (UC). **Nevada:** Elko Co., *Holmgren 897* (UC); Nye Co., *Maguire & Holmgren 25836* (UC); Washoe Co., *Archer 5102* (UC), *Heller 9988* (CAS, MO, UC), *Hillman 16 May 1896* (UC), *Williams et al. 80-2-2* (CAS), *Tiehm 4001* (MO), *Tiehm & Williams 5515* (CAS, MO). **Oregon:** Deschutes Co., *Detling 2635* (UC); Grant Co., *Henderson 5145* (CAS, MO); Klamath Co., *Applegate 4248* (CAS), *Henderson 9364* (CAS); Lake Co., *Peck 25017* (UC), *Peck 25018* (CAS, UC); Malheur Co., *Peck 20564* (UC), *Leiberg 2007* (CAS, UC), *Henderson 9042* (CAS), *Thompson 11332* (CAS, UC); Morrow Co., *Leiberg 14* (UC); Umatilla Co., *Howell 3 May 1882* (MO); Union Co., *Cusick 2194* (MO, UC); Wallowa Co., *Sherwood 459* (CAS, MO); Wasco Co., *Sheldon 10021* (CAS, MO), *Suksdorf 834* (MO, UC). **Utah:** Salt Lake Co., *Garrett 2808* (UC). **Washington:** Adams Co., *Rogers et al. 229* (CAS, MO); Benton Co., *Barkworth 687* (CAS); Grant Co., *Rogers 286* (CAS, MO, UC); Klickitat Co., *Howell 20 April 1882* (MO); Lincoln Co., *Jones 20 May 1905* (UC); Spokane Co., *Milburge 280* (CAS); Stevens Co., *Sharsmith 4010* (CAS); Whitman Co., *Elmer May 1897* (MO), *Meyer 1437* (MO); Yakima Co., *Hitchcock & Martin 3385* (CAS), *Hoover 5652* (CAS); county uncertain, *Brandegee May 1883* (UC), *Howell 20 April 1882* (CAS). **Wyoming:** Carbon Co., *Hartman 2950* (CAS); Uinta Co., *Nelson 4546* (MO), *Nelson 7187* (MO), Yellowstone N.P., *Nelson & Nelson 6074* (MO).

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Literature Cited

Campbell, G. R. 1952. The genus *Myosurus* L. (Ranunculaceae) in North America. Aliso 2: 389–403.

Davis, R. J. 1952. Flora of Idaho. Wm. C. Brown, Dubuque.

Dorn, R. D. 1984. Vascular Plants of Montana. Mountain West Publishing, Cheyenne.

———. 1992. Vascular Plants of Wyoming, ed. 2. Mountain West Publishing, Cheyenne.

Hitchcock, C. L. & A. Cronquist. 1964. Vascular Plants of the Pacific Northwest. Part 2: Salicaceae to Saxifragaceae. Univ. Washington Press, Seattle.

Kearney, T. H. & R. H. Peebles. 1964. Arizona Flora, 2nd ed. with supplement by J. T. Howell and E. McClintock. Univ. California Press, Berkeley.

Lourteig, A. 1951. Ranunculáceas de Sudamérica Templada. Darwiniana 9: 397–608.

Mabberley, D. J. 1993. The Plant-book: A Portable Dictionary of Higher Plants, revised ed. Cambridge Univ. Press, Cambridge.

Munz, P. A. & D. D. Keck. 1959. A California Flora. Univ. California Press, Berkeley.

Raven, P. H. 1963. Amphitropical relationships in the floras of North and South America. Quart. Rev. Biol. 38: 151–177.

Stone, D. E. 1957. *Myosurus*. Pp. 496–505 *in* H. L. Mason, A Flora of the Marshes of California. Univ. California Press, Berkeley.

———. 1959. A unique balanced breeding system in the vernal pool mouse-tails. Evolution 13: 151–174.

———. 1960. Nuclear cytology of the California mousetails (*Myosurus*). Madroño 15: 139–148.

Weber, W. A. & R. C. Wittmann. 1992. Catalogue of the Colorado Flora: A Biodiversity Baseline. Univ. Press of Colorado, Niwot.

Whittemore, A. T. In press. *Myosurus*. *In:* Flora of North America Editorial Committee (editors), Flora of North America North of Mexico, vol. 3. Oxford Univ. Press, New York.

Wilken, D. H. 1993. *Myosurus*. P. 923 *in* J. C. Hickman (editor), The Jepson Manual: Higher Plants of California. Univ. California Press, Berkeley.

A New Species of *Dasyphyllum* (Asteraceae–Mutisieae) from Paraguay

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ABSTRACT. A fourth species of *Dasyphyllum* sect. *Dasyphyllum* with a floral tube that is pilose on the outside is described here; the other three species are *Dasyphyllum inerme*, *D. lanceolatum*, and *D. vepreculatum*. This new species, which we name *Dasyphyllum maria-lianae*, is distinguished from the others by the broadly ovate leaves that are loosely villous above and densely villous below, a longer pedicel, a wider involucre, densely tomentose phyllaries, and a greater number of flowers.

As a result of recent exploratory work in Paraguay, a distinctive new species of *Dasyphyllum* has been collected, which we describe here. This is the fourth species of *Dasyphyllum* sect. *Dasyphyllum* [= section *Microcephala* (Baker) Cabrera] with the floral tube pilose outside and the first one with that feature recorded for Paraguay. The other three species of *Dasyphyllum* sect. *Dasyphyllum* with floral tube pilose on the outside surface are *Dasyphyllum inerme* (Rusby) Cabrera, *D. lanceolatum* (Lessing) Cabrera, and *D. vepreculatum* (D. Don) Cabrera (Cabrera, 1959). Aside from them, this feature is also known in three species of *Dasyphyllum* sect. *Macrocephala*, *D. lanosum* Cabrera, *D. fodinarum* (Gardner) Cabrera, and *D. donianum* (Gardner) Cabrera (Cabrera, 1959); this section is distinguished from section *Dasyphyllum* by the involucre larger than 2 cm high and by the heads solitary or few. With its beautiful hanging twigs covered by pale green leaves and bright yellow flowers, *Dasyphyllum maria-lianae* is a conspicuous part of the flora in the mountain forests of the Cordillera de Ybytyruzú and the Cerro Naville in eastern Paraguay.

Dasyphyllum maria-lianae Zardini & Soria, sp. nov. TYPE: Paraguay. Guairá: Mbocayaity–Melgarejo, Cerro Naville, 25°43′S, 56°21′W, forest on slopes, 6 July 1992, *Zardini & Guerrero 32470* (holotype, FCQ; isotype, MO). Figure 1.

Frutex scandens usque ca. 5 m altus ramosus, ramis tomentosis spinosis; spinae axillares geminae. Folia alterna; petioli 5–10 mm longi; laminae late ovatae, apice acutae et basi rotundatae, supra laxe villosae et inferne dense villosae, trinervatae, 5–7 cm longae et 3–4 cm latae. Capitula campanulata 10–12 mm alta et lata in paniculis; pedicelli 10–15 mm longi; phyllaria ovata apice mucronata, tomentosa. Flores ca. 28 lutei; corollae pentasectae extus villosae ad tubum et apices segmentorum. Achaenia dense et longe albo-sericea; pappi setae plumosae, albidae.

Climbing shrub to 5 m tall, much branched. Stems tomentose, hanging, with paired axillary spines. Leaves alternate; petiole 5–10 mm long; blade broadly ovate acute at apex and rounded at base, trinervate, loosely villous above and densely villous below, 5–7 × 3–4 cm. Heads in paniculate corymbiform racemes. Pedicel 10–15 mm. Involucre campanulate, 10–12 mm high and wide; phyllaries ovate mucronate at apex, tomentose. Flowers ca. 28; corolla yellow, 10–12 mm long, pentasect (segments 4–6 mm long) with one incision deeper than the others, with tube and apical parts of segments pilose on outside surface. Achenes cylindrical, 4–5 mm long, dense and long white sericeous; pappus of plumose whitish bristles 12–14 mm long.

Paratype. PARAGUAY. **Guairá:** Cordillera de Ybytyruzú, road Melgarejo–Antena, 2 km N of Antena, 25°45′S, 56°15′W, forest, 14 July 1989, *Zardini & Velázquez 13263* (FCQ, MO).

The four species of *Dasyphyllum* sect. *Dasyphyllum* with a floral tube pilose on the outside surface can be differentiated as follows:

1a. Flowers ca. 28; pedicel 10–15 mm; involucre 10–12 mm wide; phyllaries ovate; mucronate at apex, densely tomentose; leaves broadly ovate, 5–7 × 3–4 cm, loosely villous above and densely villous below; eastern Paraguay . . . . . *Dasyphyllum maria-lianae* Zardini & Soria

1b. Flowers fewer than 20; pedicel 2–7 mm; involucre 6–7 mm wide; phyllaries ovate or lanceolate, mucronate or spiny at apex, loosely villous or sericeous; leaves ovate, elliptic or

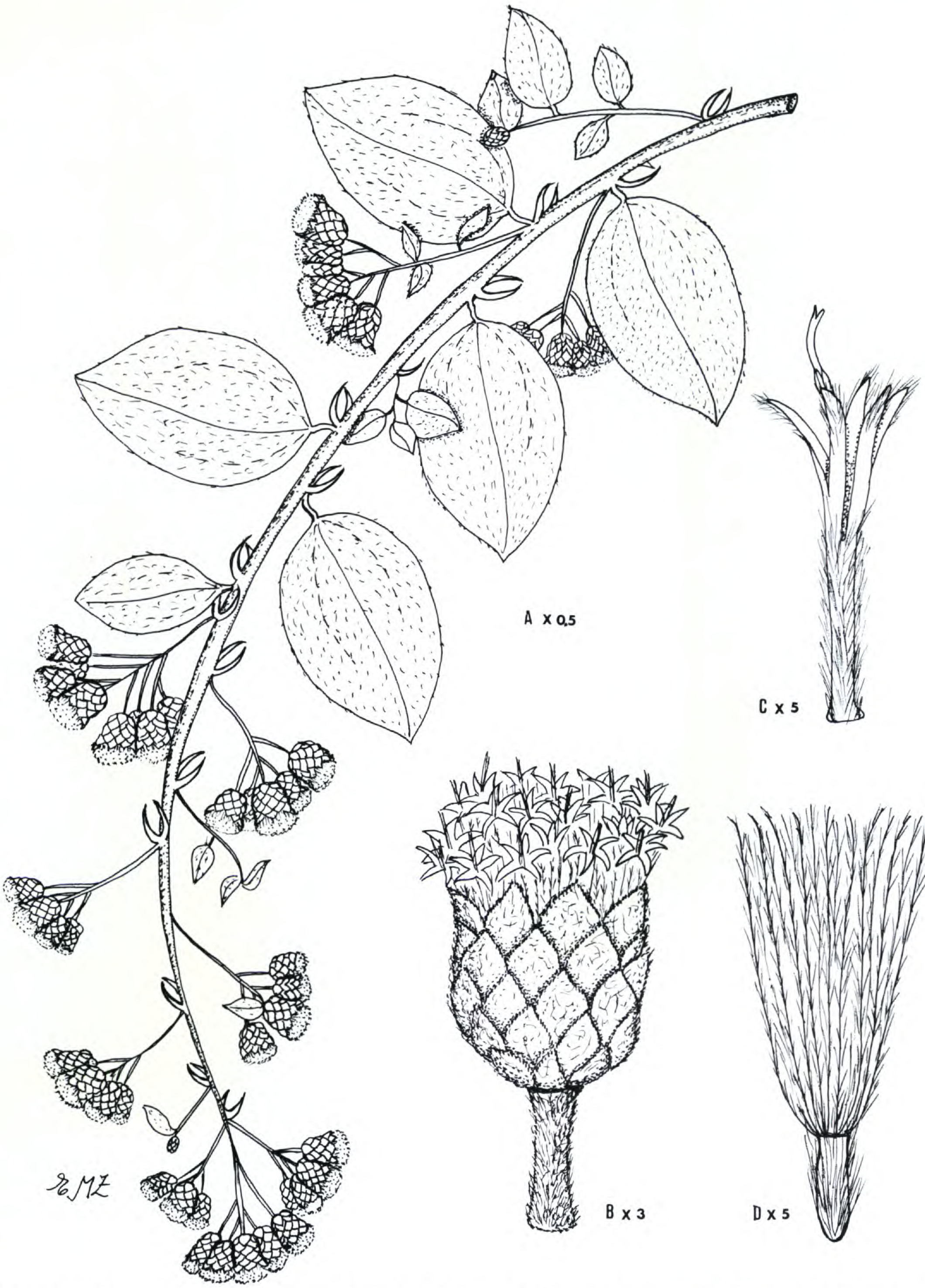

Figure 1. *Dasyphyllum maria-lianae* Zardini & Soria. —A. Flowering stem. —B. Head. —C. Corolla. —D. Achene.

lanceolate, 4.5–8 × 1.5–4 cm, glabrous above and glabrous or loosely pubescent below.

2a. Phyllaries loosely villous, mucronate at apex; southern Bolivia and northwestern Argentina ..... *Dasyphyllum inerme* (Rusby) Cabrera

2b. Phyllaries sericeous, with an apical spine 1–2 mm long.

3a. Leaves elliptic-lanceolate or ovate-lanceolate, loosely villous, 5–8 × 2–4 cm; involucre 12 mm high; Venezuela and northeastern Brazil ..... *Dasyphyllum vepreculatum* (D. Don) Cabrera

3b. Leaves lanceolate, loosely sericeous, 4.5 × 1–2 cm; involucre 8–10 mm high; southern Brazil ..... *Dasyphyllum lanceolatum* (Lessing) Cabrera

We name this species after María Liana Gentry Zardini, daughter of the senior author.

Acknowledgments. We thank the National Geographic Society for support of fieldwork and an anonymous reviewer for comments on the manuscript.

Literature Cited

Cabrera, A. L. 1959. Revisión del género *Dasyphyllum* (Compositae). Rev. Mus. La Plata, Bot. 9: 21–100.

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Novitates Gabonenses 21. A New Species of *Baphia* (Leguminosae–Papilionoideae) from Gabon

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ABSTRACT. From Gabon, Central Africa, a new species of *Baphia* is described that is distinct in having a cymose arrangement of its flowers.

The African genus *Baphia*, with ca. 46 species in total, is well represented in Gabon by some 18 species (Soladoye, 1985). This number is likely to increase with further exploration, mainly by the collection of species previously known only from the neighboring countries. Recent collections from the Lambaréné area revealed a new, distinct species.

Baphia cymosa Breteler, sp. nov. TYPE: Gabon. Lambaréné, along Ogooué River, 24 Nov. 1986 (fl), *van der Maesen 5306* (holotype, WAG; isotypes, BR, K, LBV, MO, P). Figure 1.

Baphiae laurifoliae Baillon affinis, sed inflorescentiis cymosis, bracteolis minoribus et alis et petalis carinae sine marsupio differt.

Treelet 3–4 m tall. Branches rather soon longitudinally fissured, bark peeling off in thin, long, narrow flakes. Branchlets densely brown-tomentose. Stipules not observed, very early caducous, leaving a rimlike scar. Leaves: petiole with contiguous pulvini, 5–10 mm long, grooved above, subappressed-short-brown-hairy; blade elliptic, 7–12 × 2–4 cm, (2.5–)3–4 times as long as wide, cuneate at base, obtusely acuminate at apex, the acumen 0.5–1 (–1.5) cm long, glabrous above, sparsely subappressed-short-hairy beneath, more densely so on midrib, glabrescent, lateral nerves thin, 5–7 pairs, not or only slightly prominent, the midrib plane to impressed above, prominent beneath. Flowers mostly arranged in 2–several-flowered, once to repeatedly branched, brown-tomentose cymes, sometimes single; peduncle up to 2 cm long; bracts and bracteoles broadly ovate, concave, ca. 1.5 × 1.5 mm, mostly early caducous; flower buds somewhat sickle-shaped; pedicel up to ca. 2 cm long; calyx up to ca. 15 mm long, appressed-brown-short-hairy outside, glabrous inside, spathaceous, splitting down one side; corolla white, glabrous; standard ± sessile, broadly obovate, ca. 15 × 13 mm, ± flat, but with the margin in upper part curved inwards, with a 2–2.5-mm-long split apically; wings folded ± lengthwise, 17 × 8 mm when unfolded, very shortly clawed, top obtuse, notched or not; keel petals 13 × 5–7 mm, united in the middle, shortly clawed, ± flat; stamens 10–13.5 mm long, shortly coherent at base, glabrous, anthers 2.5–3 mm long, ± basifixed; pistil ca. 15 mm long, gently curved, style ± glabrous, ovary appressed-short-hairy, 6-ovuled. Fruits unknown.

Distribution. Only known from the type locality in Gabon.

Habitat. Tropical rainforest.

Baphia cymosa is distinct because of a unique character, i.e., the arrangement of the flowers in cymes and not in fascicles, racemes, or pseudoracemes, the normal situation in *Baphia*. In the key in Soladoye's (1985) revision, *B. cymosa* will key out near *B. laurifolia* Baillon when "pulvini not contiguous" is selected at couplet 22. This might seem to be the wrong choice because *B. cymosa* has contiguous pulvini; however, according to Soladoye's description, so, possibly, does *B. laurifolia*.

Figure 1. 1–11. *Baphia cymosa* Breteler (*van der Maesen 5306*). —1. Flowering branchlet. —2, 3. Part of inflorescence. —4. Flower bud with bracteoles. —5. Flower. —6. Standard inside. —7. Wing from inside. —8. Wing from outside. —9. Keel petals. —10. Androecium. —11. Pistil. Drawn by Paul Albers.

In fact, ca. 90% of the collections in WAG have contiguous pulvini. The other choice at couplet 22, "pulvini contiguous," is worse because it leads to *B. buettneri* Harms and *B. gossweileri* Baker f., two completely different species.

From *B. laurifolia* the new species also differs by the smaller bracteoles and by the absence of pockets in the wings and in the keel petals.

Literature Cited

Soladoye, M. O. 1985. A revision of *Baphia* (Leguminosae–Papilionoideae). Kew Bull. 40(2): 291–386.

Novelties in the Pleurothallidinae (Orchidaceae) for the Venezuelan Flora

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ABSTRACT. Two new species, *Pleurothallis phoenicoptera* and *P. steinbuchiae*, are described. *Pleurothallis delascioi* is synonymized under *P. kerrii*. Several other members of the Pleurothallidinae are recorded for the first time for Venezuela.

During the course of our studies on the Venezuelan orchid flora for several floristic projects, including the *Flora of the Venezuelan Guayana*, the following species, previously unrecorded within the country's boundaries, were detected.

Lepanthes spelynx Luer & Escobar, Amer. Orchid Soc. Bull. 54: 586. 1985.

Among several other *Lepanthes* species recently collected in Andean Venezuela, this taxon is a new record for Venezuela.

Specimen examined. VENEZUELA. **Mérida:** cloud forest at La Montaña study area, ca. 0.5 km S of La Montaña Teleférico Station, 2,450–2,650 m, 26 Sep. 1987, *D. L. Kelly 9100* (K, VEN).

Pleurothallis archidiaconi Ames, Sched. Orch. 9: 29. 1925. TYPE: Trinidad–Tobago. Trinidad: Verdant Valley, 11 Dec. 1924, *Hombersley s.n.* (holotype, AMES).

Pleurothallis archidiaconi Ames is widespread in the northern Amazon Basin, the Guayana Highlands, the Coastal Range of Venezuela, Trinidad–Tobago, and along the lower elevations of the eastern Andean foothills in Venezuela at 50–1,300(–1,500) m. Although similar to many other species in the *Macrophyllae-Fasciculatae*, *Pleurothallis archidiaconi* is characterized by its shallowly cordate, apically acuminate leaf, a 3-nerved dorsal sepal, 5–7 mm long, subequal or somewhat narrower than the synsepal, relatively broad, oblong petals with serrate or denticulate margins and obtuse to acute apices. The labellum is broadly ovate to broadly ovate-oblong, convex above the middle, and the apex is obtuse to rounded. The margins of the labellum are microscopically erose. The corners at the base of the labellum are distinctly angled to either side of the concavity, which accommodates the column foot. In some populations, the margins of the labellum are somewhat incurved in the middle part making the labellar outline pandurate in natural shape. The flower color varies from dark red in the Venezuelan Guayana and Coastal Range to yellow-brown with darker brown or reddish nerves in most other populations, including the typical one from Trinidad; all color combinations may be present in some populations. The plants are average sized for the *Macrophyllae-Fasciculatae*. Although collected many times, especially in Venezuela, the species has frequently been misidentified. Forms of the species with incurved labellar margins have been collected in Surinam (photographed by Werkhoven, 1986: 181, as *P. monocardia* Reichenbach f.) and in some areas of the Venezuelan Guayana, from where it was misidentified as *Pleurothallis stenocardium* Schlechter by Foldats (1970: 418). *Pleurothallis stenocardium* is a species from higher elevations in the Guayana Highland tepuis with smaller flowers and different perianth segments. The Venezuelan material from the Coastal Range and the Andes has been identified by Dunsterville & Garay (1959: 337) and by Foldats (1970: 345) as *Pleurothallis monocardia*, a Colombian Andean species with differ-

ently proportioned flowers. The name *Pleurothallis archidiaconi* was mistakenly applied by these same authors to a completely unrelated Andean species (known in Venezuela from Táchira and Trujillo) with smaller yellow flowers and reflexed petals, probably *Pleurothallis phyllocardioides* Schlechter (C. Luer, pers. comm.). *Pleurothallis omoglossa* Luer, from the eastern slopes of the Andes in Ecuador, is very closely related and may prove to be conspecific. The Guyanan *Pleurothallis curvifructa* H. G. Jones [Bradea 1(23): 263. 1972] may also be conspecific with *P. archidiaconi*, judging from the scanty description, but the type of this concept has not been available for confirmation. The material cited as *Pleurothallis monocardia* from French Guiana by Cremers & Hoff (1992: 66) probably also represents this species. A good picture of the flower of *Pleurothallis archidiaconi* was published by Kenny (1988: 29).

The Surinamese and Brazilian collections cited herein are the first published records of *Pleurothallis archidiaconi* from these countries.

Representative specimens examined. BRAZIL. **Pará:** Río Maicuru, 1°00′S, 54°30′W, 25–26 July 1981, *Jangoux & Ribeiro 1531* (INPA, MPEG, NY, SEL). SURINAM. Wilhelmina Mountains, 900 m, 7 July 1981, collected by R. Determann s.n., cultivated at SEL under the reference number 81-2180, flowering 1 Feb. 1982, *Luer 6818* (SEL). VENEZUELA. **Bolívar:** Carretera El Dorado–Santa Elena de Uairén road, *Aristeguieta 3708* (VEN), km 115 S of El Dorado, ca. 800 m, 2 Aug. 1993, *Carnevali et al. 3233* (MO, MY, VEN). **Distrito Federal:** between Petaquire and Carayaca, 1,300–1,500 m, *Steyermark & Nevling 95925* (VEN).

Pleurothallis chloroleuca Lindley, Orch. Linden. 2: 1846.

This species, closely related to *Pleurothallis ruscifolia* (Jacquin) R. Brown, but much larger, is recorded for the first time from Venezuela.

Specimen examined. VENEZUELA. **Táchira:** cloud forest, Páramo de Tamá, *Dunsterville 1001* (VEN; line drawing, AMES).

Distribution. Colombia (type), Ecuador, Venezuela.

Pleurothallis corynetes Luer & Vásquez, Phytologia 46(6): 363. 1980.

This species resembles *Pleurothallis setigera* Lindley but the apex of the labellum is clavate, echinate. Previously known only from Bolivia, it is now recorded for the first time from Venezuela.

Specimen examined. VENEZUELA. **Mérida:** Carretera Guaraque–Tovar, 2,460 m, 7 June 1967, *Trujillo & Del Castillo 8297* (MY).

Distribution. Bolivia, Venezuela.

Pleurothallis geographica Luer, Selbyana 3: 310. 1977.

This member of subgenus *Pleurothallis* sect. *Macrophyllae-Fasciculatae* is characterized by elongated stems, relatively small cordate, acuminate leaves, and small flowers with a distinctive labellum with minute, irregular, branching rows of shallow verrucae with larger tuberosities toward the apex, resembling a geographic surface. It was previously known from Andean Ecuador and Colombia (C. Luer, pers. comm.), but it has been collected recently from the top of one of the Guayanan tepuis. The Andean populations of this species have somewhat larger flowers (dorsal sepal 6.5–8 mm long) with yellow sepals and petals and a red-purple labellum, whereas the Guayanan material exhibits a dorsal sepal 4–4.5 mm long and the flowers have been described by the collectors as magenta.

Specimen examined. VENEZUELA. **Bolívar:** Macizo del Chimantá, Apacaratepui, in clumps on rock outcrops of bluff escarpment along stream, 5°20′N, 62°12′W, ca. 2,200 m, 20 Jan. 1983, *Steyermark, Huber & Carreño-Espinoza 128271* (MO, VEN).

Pleurothallis kerrii Braga, Bradea 3: 172. 1981. TYPE: Brazil. Amazonas: afluente do rio Marié, 16 Oct. 1978, *Madison, Braga & Kennedy (PFE 366)* (holotype, INPA 85086).

Pleurothallis delascioi Carnevali & I. Ramírez, Ernstia 31: 6. 1985. Syn. nov. TYPE: Venezuela. Amazonas: 1–2 km SE and E of San Carlos de Río Negro, ca. 20 km S of confluence of Río Negro and Brazo Casiquiare, 1°56′N, 67°3′W, 120 m, 22 Apr. 1979, *Liesner 6860* (holotype, VEN; isotype, MO).

Pleurothallis delascioi was described from badly preserved herbarium material and was judged at that time to be different from Braga's species. More abundant material has shown both concepts to be conspecific. Recently it was collected in Amazonian Peru, a new record for that country. All previously known collections were from dwarf forests on white sand soils, with annual precipitation of more than 3,000 mm; recently it has been documented from tropical rainforests in northern Amazonas in Venezuela in areas with ca. 2,000–2,500 mm of precipitation. These collections are mostly cleistogamous. *Pleurothallis kerrii* is now known from Amazonian Brazil, Peru, and Venezuela.

Representative specimens studied. PERU. **Loreto:** Distrito Iquitos, Maynas, km 8 carretera Quisto–Cocha, Varillal, perched forest over sand, 130 m, epiphytic with habit of *Peperomia*, 24 July 1984, *McDaniel & Rimachi 27837* (MO). VENEZUELA. **Amazonas**: Departamento

Atures, Río Cataniapo, vic. Salto Nieves, 100–200 m, 14 nov. 1984, *Romero & Beer-Romero 1431* (VEN); Caño Coromoto, ca. 1 km al E del Tobogán de la Selva, 100–200 m, 9 oct. 1988, *Romero & Guánchez 1613* (AMES, MO, TFAV, VEN).

Pleurothallis macrocardia Reichenbach f., Bonplandia 3: 72. 1855.

This member of the cordate-leaved section of *Pleurothallis* features one of the largest flowers in the group. Originally described from Ocaña, Norte de Santander, Colombia, just across the border from Venezuela, it has recently been collected on the Venezuelan side of the Páramo de Tamá. It is also recorded from Ecuador (C. Luer, pers. comm.) The Venezuelan material has translucent straw-yellow sepals, petals of the same basic color but suffused with red, and a dark red-maroon labellum.

Specimen examined. VENEZUELA. **Táchira:** Páramo de Tamá, 2,400 m, 1992, leg. Carlos García-Esquivel, *Carnevali 2969* (VEN).

Pleurothallis phoenicoptera Carnevali & G. Romero, sp. nov. TYPE: Venezuela. Bolívar: Cerro de la Piedra del Canaima, 10–12 km SE of Santa Elena de Uairén, dwarf sclerophyllous cloud forest with many epiphytes, 1,250 m, Nov. 1982, *Carnevali & Pivat 1426* (holotype, VEN). Figure 1.

Species haec *P. hamosa* Barbosa Rodrigues sed inflorescentiis unifloris, floribus flavo-viridis recurvatis, sepalo dorsali linear acuto, synsepalo integro abhorret.

Epiphytic herbs, creeping. Rhizome elongate, 1–2 cm between stems, covered by scarious sheaths. Stems 2–5 cm long, erect or subpendent, apically recurved, apical half ca. 3 mm thick, markedly compressed with the adaxial margin minutely sulcate below the junction with the leaf, narrowly rhombic-elliptic in cross section. Leaves 3–4 cm long, 2–3 cm wide, ovate or ovate-elliptic, apex obtuse, minutely tridenticulate, blade green-purple, thickly fleshy, at an angle of 90° or more to the stem, deeply and rigidly concave. Inflorescences 1-flowered, from the base of the leaf; peduncle ca. 5 mm long; pedicel ca. 5 mm long. Flowers deeply seated in the concavity of the leaf, resupinate, apparently always cleistogamous, parallel to the leaf, fleshy. Sepals dorsally carinate, white suffused with purple within, becoming green-yellow on the fruit; dorsal sepal 5–8 mm long, 1–1.2 mm wide, linear-oblong, concave, 3-nerved, recurved in the apical third on the fruit; lateral sepals totally connate into a deeply concave synsepal 7.5–8 mm long, 4.5–5.5 mm wide, decurved apically, when forcefully flattened ovate, acute, 6-nerved. Petals 2–2.5 mm long, 0.7–1 mm wide, white, rhombic-elliptic, slightly oblique, acute, 1-nerved, basally attenuated, apical margins erose or finely denticulate. Labellum 3–4 mm long, ca. 2 mm wide, white, lightly marked with purple on the margins, fleshy, in general outline ovate triangular, acute, margins ciliate-fimbriate, basally broadly hinged and provided just above the hinge with a pair of oblong, truncate, retrorse lobules ca. 4 mm long; disk verruculose, provided in the basal two-thirds with two thick crests that flank a central concavity. Column 2.4–3 mm long, terete, apically shallowly two-winged, basally produced into a ca. 1-mm-long, dark purple foot. Capsules ellipsoid, 10–15 mm long. [Subgenus *Acianthera* (Schweidweiler) Luer, sect. *Sicariae* Lindley, subsect. *Pectinatae* Luer.]

This species resembles vegetatively and florally the south Brazilian species *Pleurothallis hamosa* Barbosa Rodrigues. It is distinct, however, in the 1-flowered inflorescences, the linear or linear-oblong, acute dorsal sepal and in the completely connate, concave synsepal. The same set of character states clearly differentiates *P. phoenicoptera* from the Andean *P. harpophylla* Reichenbach f. The flowers are apparently always cleistogamous, almost cylindric but apically recurved. Eventually all flowers develop into conspicuous capsules that are partially hidden by the deep concavity of the leaf. This is the second species of the Brazilian subsection *Pectinatae* to be found in the Guayana Highlands, the other being *P. prolifera* Herbert ex Lindley.

Pleurothallis phoenicoptera grows as an epiphyte in dwarf sclerophyllous cloud forests at 1,250–1,450 m altitude where it has been collected only three times. The epithet suggests a fancied resemblance of the unopened persistent perianth on top of the fully developed capsules to the head and beak of a flamingo (*Phoenicopterus* spp.).

Paratypes. VENEZUELA. **Amazonas:** Cerro Duida, Savanna Hills, 4,400 ft., Aug. 1928–Apr. 1929, *Tate 823* (NY). **Bolívar:** Salto Torón, between Luepa and Kavanayén, 1,300 m, Jan. 1980, *Dunsterville 1411* (AMES, SEL).

Pleurothallis prognatha Luer & Escobar, Orquideología 16(1): 30. 1983.

This unique species of subgenus *Acianthera* sect. *Brachystachyae* Lindley was described from Andean Colombia close to the Venezuelan border. Now it is documented for the first time for Venezuela.

Specimens examined. VENEZUELA. **Táchira:** Cazadero, Quebrada Cazadero, 16 km NW of San Cristóbal, 7°54′N, 72°18′W, 650–900 m, 4 May 1981, *Liesner*

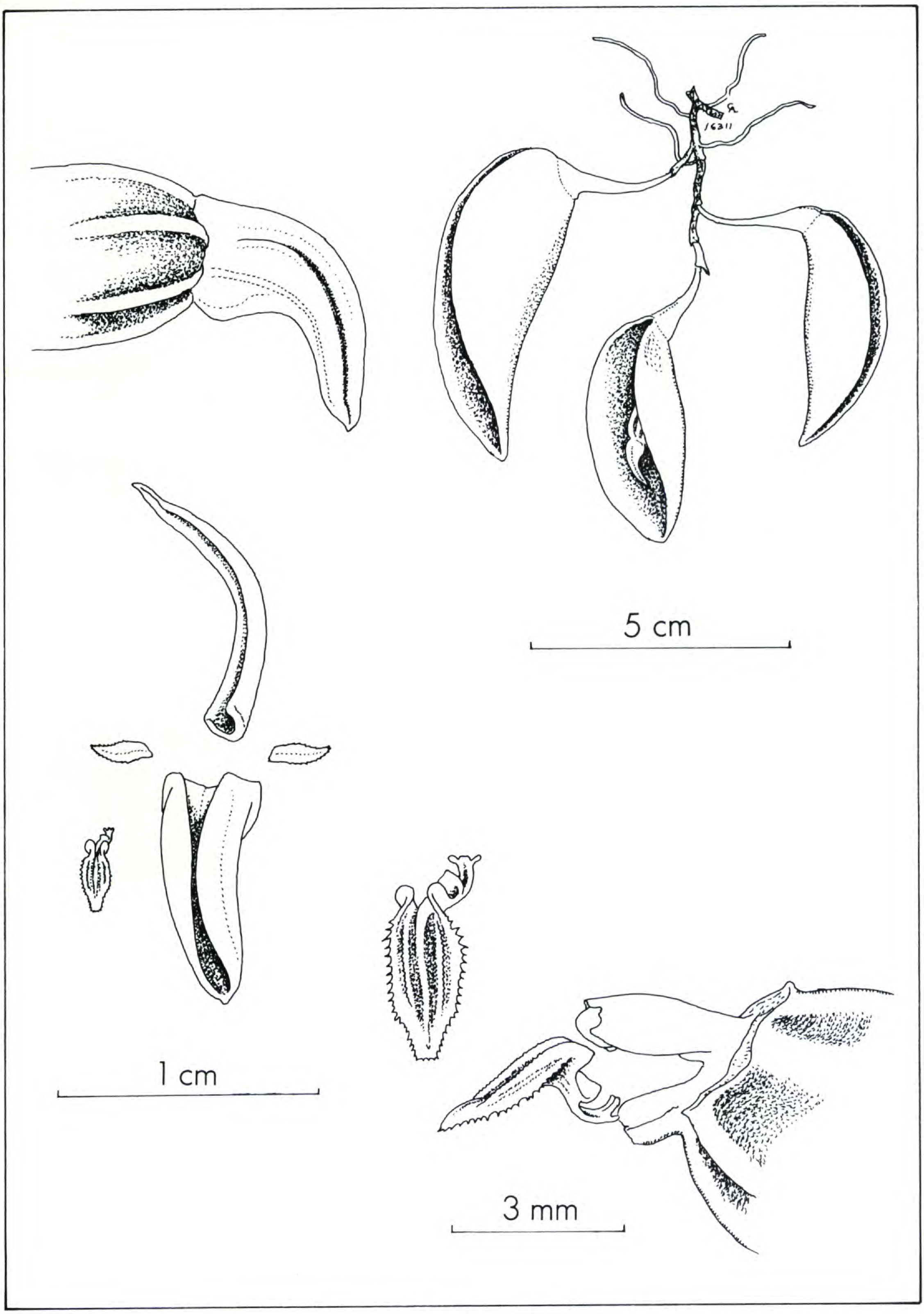

Figure 1. *Pleurothallis phoenicoptera* Carnevali & G. Romero (based on *Carnevali & Pivat 1426*, VEN).

& Guariglia 11794 (MO, VEN); Páramo de Tamá?, cultivated and flowered by L. Ferré from Caracas, 1992, *Carnevali 2972* (VEN).

Pleurothallis serpens Luer & Escobar, Orquideología 16(1): 31. 1983.

This species of the affinity of *Pleurothallis lindenii* Lindley was described from the Santander del Norte Colombian Department, just across the Venezuelan border. It is now reported for the first time in Venezuela.

Specimen examined. VENEZUELA. **Táchira:** Selva nublada, faldas debajo del Páramo de Tamá, cerca de la frontera con Colombia, 2,475–2,550 m, 18–20 mayo 1967, *Steyermark et al. 98494* (VEN).

Pleurothallis steinbuchiae Carnevali & G. Romero, sp. nov. TYPE: Venezuela. Bolívar: Cerro Guaiquinima, originally collected by Gustavo Santana and Edith Steinbuch, *Carnevali 2957* (holotype, VEN). Figure 2.

Species haec *P. barbulata* Lindley sed planta prostrata, rhizoma repente, foliis proportione latioris, rachis elongatiore longioribus, petalis latioribus apice rotundatis, labello linear-oblongo eciliato differt.

Epiphytic herbs, creeping, stems and leaves prostrate or suberect. Rhizome terete, 0.5 mm thick, 1–3 mm long between stems, clothed by scarious sheaths. Stems 0.8–1 mm long, terete. Leaves 5–8 mm long, 2.5–3.5 mm wide, elliptic to obovate-elliptic, somewhat oblique, apex minutely mucronate, base attenuated into a short, thick pseudopetiole ca. 1 mm long, margins marginate; blade fleshy, face lightly concave, back convex, no midnerve indicated on either side. Inflorescence 8–15 mm long, a lengthening raceme of successive flowers borne from the apex of the stem; peduncle 7–11 mm long, terete, with a 1-mm-long sheath about the middle; rachis 3–4 mm long, fractiflex, 2–5(more?)-flowered; floral bracts ca. 1 mm long, elliptic. Flowers resupinate, widely opening, sepals and petals translucent maroon-pink, labellum dark maroon. Sepals convex; dorsal sepals 3.3–3.5 mm long, 1–1.2 mm wide, 3-nerved, narrowly elliptic to narrowly lanceolate, acute; lateral sepals united into a synsepal 3–4 mm long, 2–2.5 mm wide, 4-nerved, ovate, the apical 0.2–0.5 mm free. Petals 1.3–1.6 mm long, ca. 0.7 mm wide, parallel to the column, 1-nerved, narrowly oblong to oblong-obovate, rounded, apical margins erose. Labellum 3–3.2 mm long, 0.8–1.1 mm wide, ligulate, articulate with the base of the column, linear-oblong to oblong, apex obtuse, basal margins finely ciliate or subfimbriate, apical margins glabrous, blade convex with a longitudinal groove in the basal three-fourths flanked by two longitudinal calli that terminate in an erect bilobed projection above the base, base membranously bilobed. Column ca. 2.5 mm long, membranous, slightly arcuate, apical margins irregularly toothed; stigma ventral. [Subgenus *Specklinia* (Lindley) Garay sect. *Muscosae* Lindley.]

Pleurothallis steinbuchiae belongs to a small group within section *Muscosae* characterized by tiny plants with very abbreviated stems and mostly obovate leaves, hyaline, pink to dark maroon flowers, convex, widely spreading sepals with highly connate synsepals, erose to dentate petal apices, and usually ciliate to fimbriate labella. Close relatives of *Pleurothallis steinbuchiae* are *P. barbulata* Lindley, *P. minima* C. Schweinfurth, and *P. abjecta* Ames. *Pleurothallis steinbuchiae* is easily distinguished from these three species by the creeping rhizome and prostrate leaves, by the apically rounded petals, and the eciliate apical half of the labellum.

The following key summarizes the differences between the species of this complex that occur in the Venezuelan Guayana:

1a. Rhizome elongate, plants shortly creeping; leaves prostrate or ascending; petals apically rounded; labellum glabrous except for some subfimbriate, short hairs near base ..... *P. steinbuchiae*

1b. Rhizome abbreviated, plants caespitose; leaves erect; petals acute to acuminate; labellum marginally ciliate throughout.

2a. Rachis short but conspicuous; flowers not emerging from a cuplike bract at the top of the peduncle; clinandrium deeply trilobed; synsepal concave, only slightly reflexed in natural position ..... *P. minima*

2b. Rachis very abbreviated, all flowers emerging from a cuplike bract at the top of the peduncle; clinandrium irregularly dentate; synsepal reflexed in natural position .... *P. barbulata*

Dunsterville & Dunsterville 16 was based on an immature flower bud, which may explain the floral differences when compared to the type specimen. The species is named after Edith Steinbuch of Caracas, Venezuela, who participated in the collection of the type specimen and is one of the most knowledgeable and enthusiastic orchid amateurs in Venezuela.

Paratype. VENEZUELA. **Bolivar:** W margin of "False Falls" tributary of Río Churún, ca. 1,600 ft., Sep. 1966, *Dunsterville & Dunsterville 16* (AMES).

Restrepia striata Rolfe, Gard. Chron. ser. 3, 9: 137. 1891.

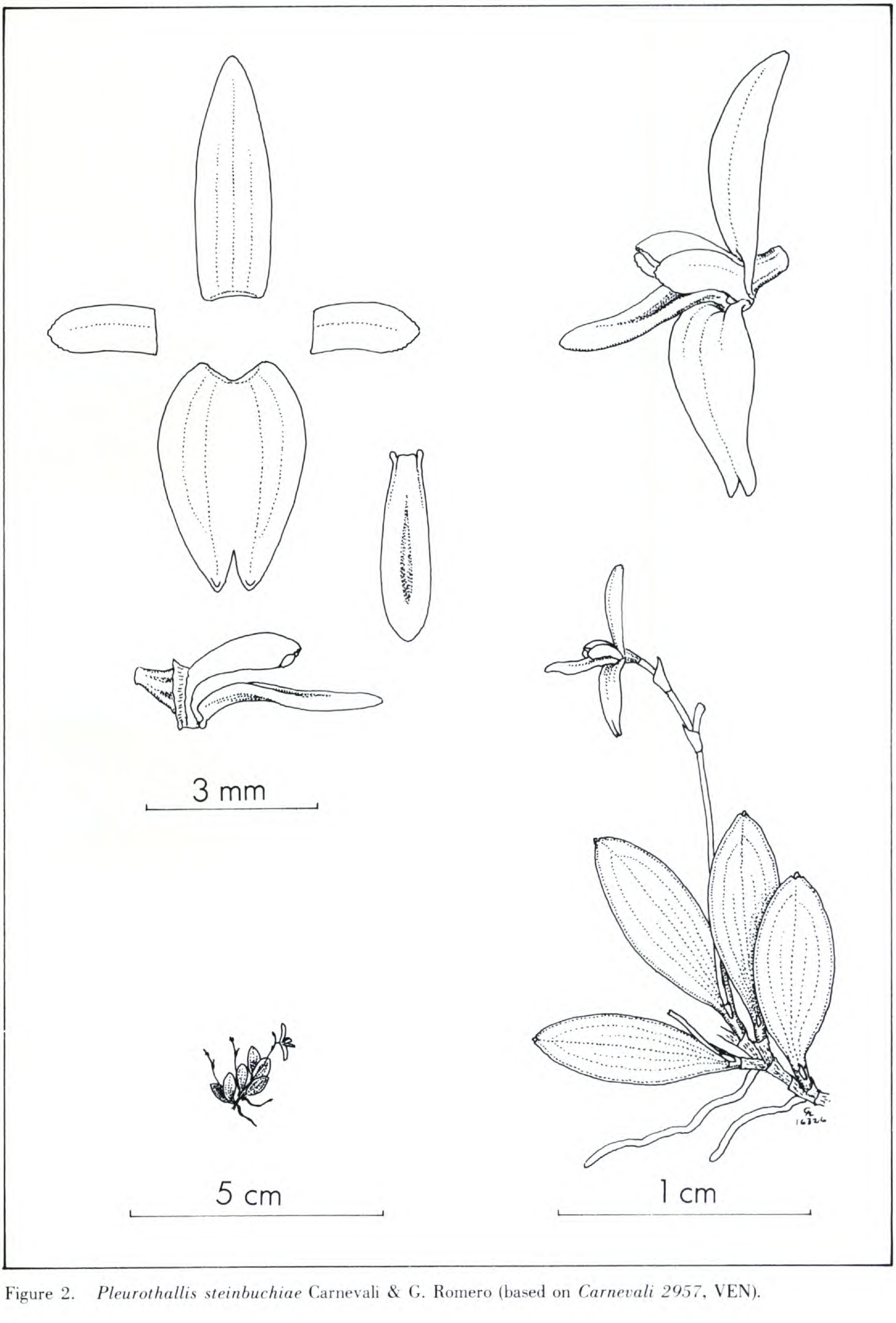

Figure 2. *Pleurothallis steinbuchiae* Carnevali & G. Romero (based on *Carnevali 2957*, VEN).

This showy species is characterized by the conspicuously papillate labellum and large flowers. Here it is recorded for the first time from Venezuela. It was previously known from Colombia.

Specimen examined. VENEZUELA. **Táchira:** Páramo de Tamá, 2,400 m, 1992, leg. Carlos García-Esquivel, *Carnevali 2971* (VEN); northern side of the pass N of Las Delicias, 1,900 m, collected by R. Mejía, *Dunsterville & Dunsterville 1215* (AMES).

Stelis pygmaea Cogniaux, Urb. Symb. Ant. 6: 390. 1909.

Venezuelan material of this little species has been previously misidentified as *Stelis trichorrhachis* Reichenbach f., a much larger and differently proportioned taxon from the eastern Andes. The species is easy to recognize among Guayanan *Stelis* because of its small vegetative size and well developed stems; the flowers are pale green or greenish yellow, always cleistogamous. *Stelis pygmaea* occurs in cloud forests at elevations of 800–1,500 m, where it can be locally common. Good illustrations of this species are found in Dunsterville & Garay (1966: 323, as *Stelis trichorrachis*, plant and flower) and in Garay (1979: 228, flower). The distribution of *Stelis pygmaea* fits the pattern found for several other pleurothallids that are only known from northeastern and Guayanan Venezuela, and the West Indies (Carnevali & Ramírez, 1993). Examples of this distributional pattern are *Brachionidium parvum* Cogniaux, *Lepanthes dussii* Urban, and this *Stelis*. In other cases, the closest relatives of a Guayanan species are Antillean taxa. Examples are *Lepanthes marahuacensis* Carnevali & I. Ramírez and *L. unitrinervis* Carnevali & I. Ramírez, both of which are closely related to the West Indian complex of species around *L. dussii*.

Representative specimens studied. VENEZUELA. **Bolívar:** La Escalera, km 115 S of El Dorado, ca. 800 m, 15 Aug. 1987, *Carnevali & I. Ramírez 3133* (VEN), 2 Aug. 1993, *Carnevali et al. 3232* (MO, NY, VEN). **Falcón:** Sierra de San Luis, 1,200–1,400 m, 9 Aug. 1993, *Carnevali et al. 3285* (MO, VEN). **Miranda:** Los Guayabitos, 1,200–1,500 m, June 1955, *Dunsterville & Dunsterville 282* (AMES, VEN; the plate mistakenly published as #283 in Ven. Orch. Ill. 4: 321. 1966).

Trichosalpinx egleri (Pabst) Luer, Phytologia 54: 395. 1983. *Pleurothallis egleri* Pabst, Ann. XIV Congr. Bot. Bras.: 14. 1964.

Most of the Guayanan collections previously attributed by Foldats (1970: 218–219) to *Pleurothallis blaisdelli* S. Watson [= *Trichosalpinx blaisdelli* (S. Watson) Luer] have proven to represent this species described from Amazonian Brazil, and as such they represent a new record for the Venezuelan orchid flora. The true *T. blaisdelli* is restricted to Central America. *Trichosalpinx egleri* is also known from Guyana and Surinam. The plant pictured by Werkhoven (1986: 188) as *Pleurothallis ciliaris* (Lindley) L. O. Williams [= *Trichosalpinx ciliaris* (Lindley) Luer] is *Trichosalpinx egleri*. Both the illustration published as *Pleurothallis blaisdelli* by Dunsterville & Garay (1976: 329) and the plant pictured as *Pleurothallis memor* Reichenbach f. [= *Trichosalpinx memor* (Reichenbach f.) Luer] by Werkhoven (1986: 202) are *Trichosalpinx dependens* (Luer) Luer.

Specimens examined. VENEZUELA. **Delta Amacuro:** Río Cuyubini, Cerro La Paloma, Sierra Imataca, 100–200 m, 18 Nov. 1960, *Steyermark 87660* (NY). **Bolívar:** Sierra Imataca, Río Toro (Río Grande), between Río La Reforma and Puerto Rico, N of El Palmar, 200–250 m, 14 Dec. 1960, *Steyermark 88072* (NY, VEN); cloud forest on Cerro El Picacho, N of Las Nieves, 45 km E of Tumeremo, Altiplanicie de Nuria, 600–650 m, 5–6 Feb. 1961, *Steyermark 89215* (NY).

Acknowledgments. Carlyle A. Luer kindly allowed us the use of his unpublished plates of *Pleurothallis phoenicoptera* and *P. steinbuchiae* and confirmed several of the determinations. He also provided important discussion and information; his input is gratefully acknowledged. The curators of MO, NY, SEL, and VEN kindly made their specimens available for study. Part of the research leading to this publication was conducted while the senior author was a visiting scientist at the Marie Selby Botanical Gardens. The Department of Graduate Students at the Missouri Botanical Garden provided financial support toward this publication. We are grateful to Gustavo A. Santana and Edith Steinbuch for carefully pickling orchid material on their collecting trip to Cerro Guaiquinima, including the type of *Pleurothallis steinbuchiae*.

Literature Cited

Carnevali, G. & I. Ramirez. 1993. New or noteworthy orchids for the Venezuelan Flora. IX: New taxa, new records, and nomenclatural changes, mainly from the Guiana Shield and northern Amazonas. Novon 3: 102–125.

Cremers, G. & M. Hoff. 1992. Inventaire taxonomique des plantes de la Guyane Française (second partie: Les Orchidacées). Collection Patrimoines Naturels 7. Muséum National D'Histoire Naturelle, Paris.

Dunsterville, G. C. K. & L. Garay. 1959. Venezuelan Orchids Illustrated 1. Andre Deutsch, London.

——— & ———. 1966. Venezuelan Orchids Illustrated 4. Andre Deutsch, London.

——— & ———. 1976. Venezuelan Orchids Illustrated 6. Andre Deutsch, London.

Foldats, E. 1970. *Pleurothallis*. Pp. 173–453 in Flora de Venezuela 15(2).

Garay, L. A. 1979. Systematics of the genus *Stelis* Sw. Bot. Mus. Leafl. 27: 167–259.

Kenny, J. 1988. Native Orchids of the Eastern Caribbean. MacMillan Caribbean, London.

Luer, C. A. 1976. Miscellaneous species of *Pleurothallis*. Selbyana 3(1–2): 38–202.

Werkhoven, M. C. M. 1986. Orchideên van Suriname. Orchids from Suriname. VACO, Paramaribo.

Hemerocallis hongdoensis (Liliaceae): A New Species from Korea

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ABSTRACT. *Hemerocallis hongdoensis*, a new species of section *Fulvae*, is described. *Hemerocallis hongdoensis* occurs in rocky and humus soil on talus slopes or rocky cliffs on remote islands off the southwestern coast of Korea. *Hemerocallis hongdoensis* is most closely related to *H. aurantiaca* but differs from this species by its underground parts lacking a rhizome, deciduous leaves, ovate-lanceolate bracts below inflorescences which are 1.2–3.5 cm long, dichotomous or trichotomous inflorescences which are 3–9 cm long, stout perianth tube (2.4–3.2 cm × 5.5–6.0 mm), orange-yellow perianth lacking a red tinge, and a different flowering period.

Hemerocallis L. is an economically important genus of approximately 30 species restricted mainly to eastern Asia (Matsuoka & Hotta, 1966). *Hemerocallis* has been placed in the Liliaceae (Cronquist, 1981; Hutchinson, 1964) or Hemerocallidaceae (Dahlgren et al., 1985). Matsuoka & Hotta (1966) and Hotta (1986) pointed out that the major difficulty with the classification of *Hemerocallis* lies in the uncertainty regarding criteria for delimiting the species. The taxonomic difficulties have been attributed to the relatively small number of diagnostic characters. Many species (e.g., *H. aurantiaca* Baker, *H. flava* L., *H. fulva* L., and *H. thunbergii* Baker) were described on the basis of cultivars with unknown origins (Matsuoka & Hotta, 1966), and with the additional problems of extreme difference in appearance between living plants and dried herbarium specimens (i.e., floral morphology and color of perianth), missing label data on dried herbarium specimens (i.e., flowering time and odor) (Matsuoka & Hotta, 1966), and possible widespread hybridization (Kitamura et al., 1986). For these reasons, the treatment of species within *Hemerocallis* has varied depending on the authors. For example, Matsuoka & Hotta (1966) and Hotta (1986) treated *H. littorea* Makino as a variety under *H. fulva*, while Kitamura et al. (1986) treated the taxon as a variety under *H. aurantiaca*. Matsuoka & Hotta (1966) also noted that Bailey (1930), Nakai (1932), and Stout (1941) did not consider the variability of natural populations when developing their classifications. Based on the literature for *Hemerocallis* (e.g., Bailey, 1930; Nakai, 1932; Stout, 1941; Ohwi, 1965; Matsuoka & Hotta, 1966; Hotta, 1986; Kitamura et al., 1986), the Japanese *Hemerocallis* are relatively well known with respect to their geographical and ecological distribution. On the other hand, the daylilies native to Korea are not well understood taxonomically. In 1988, 1991, 1992, and 1993, we conducted field trips to collect daylilies from natural populations in Korea in order to better understand the variation of morphological characters and geographical and ecological distribution. In 1988 and 1993, while visiting the remote islands of Hong, Sohuksan, and Taehuksan off the southwestern coast of Korea, we encountered a morphologically distinct group of *Hemerocallis* populations not referable to any described species. In the herbaria at Seoul National University (SNU) and Tokyo University (TI), which we visited, there were two undetermined specimens of this group collected by Ishidoya and T. Chung (TI). This series of populations is a new species as described below, and is named after the type locality, Hong Island.

Hemerocallis (sect. *Fulvae* Nakai em.) **hongdoensis** M. Chung & S. Kang, sp. nov. TYPE: Korea. Chollanam Do, Shinan Gun, Huksan Myeon, Hong Island, Hongdo-1-gu, among rocky and humus soil on E-facing talus slope, open area, ca. 30 m, 16 Aug. 1993, *M. G. Chung & S. S. Kang 2028* (holotype, GNUC; isotypes, GA, GNUC, MO, SNU, TI). Figure 1.

Radices perennes, tuberoso-inflatae, fuscae; folia viridiflava radicaria districa complanata vel striata, arcuato-deflexa, 60–100 cm longa, 1.7–3.0 cm lata; scapi erecti robustiusculi, 60–76 cm longi, 5–8 mm crassi, plerumque cum 1–2 ovata-lanceolatae bracteae. Inflorescentia dichotoma vel trichotoma, 5–17(–25)-floris 3–9 cm longi; pedicelli 1 cm longi 4 mm crassi; flores ascendentes; periantha aurantiaca-flava infundibularia 10.4–14.2 cm longa tenuiter succulentus; tubus crassus ca. 2.4–3.2 cm longi 5.5–6.0 mm crassis dilutus viridi-aurantiacus; lobi interiores 8–11 cm longi, 2.7–3.4 cm lati, margine integer, lobi exteriores lanceolati apice naviculato-acuti, 7.8–10.5 cm longi 1.3–1.7 cm lati. Capsula oblongus-ovalis, apice emarginati, pagina verruciformis, 2.5–4.1 cm longa 1.7–2.5 cm lata; semina nigra lucidula ca. 7 mm longa 5 mm lata.

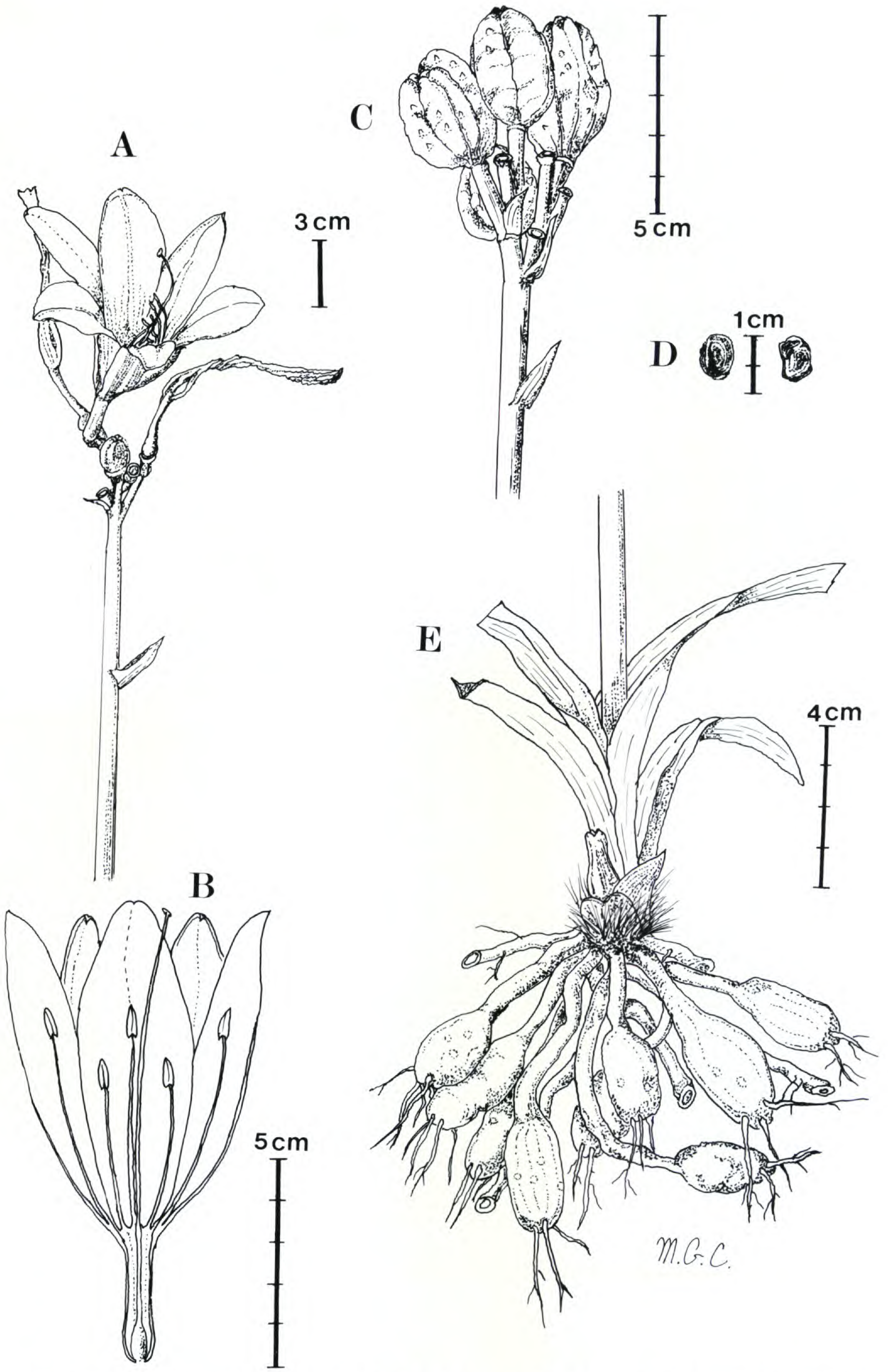

Figure 1. A–E *Hemerocallis hongdoensis* M. Chung & S. Kang. —A. Flowers on the erect scape. —B. Vertical section of flower. —C. Fruits on the erect scape. —D. Seeds. —E. Root system. Drawing by the senior author based on the holotype when fresh.

Herbaceous perennials. Roots fusiform-tuberous, 2.5–3.5 cm long, 1 cm wide, brown with gray tint. Leaves rather thick, 60–100 cm long, 1.7–3.0 cm wide, smooth, surface flat or striated glaucous, greenish yellow. Scapes erect, robust, 60–76 cm long, nearly as long as or shorter than leaves, somewhat thickened, ca. 5–8 mm wide at the base, usually with 1–2 ovate-lanceolate bracts below the inflorescence, 1.2–3.5(–8.0) cm long, 10 mm wide. Inflorescence dichotomous or trichotomous with the same emergent degree, with 5–17(–25) flowers, 3–9 cm long, pedicels 1 cm long, 4 mm wide, usually longer than the subtending bracts; bracts ovate, greenish, membranous on margin. Perianth (when fresh) orange-yellow lacking red tinge, tubular-funnelform, 10.4–14.2 cm long; tube stout, ca. 2.4–3.2 cm long, 5.5–6.0 mm wide, green with orange tint; throat orange-yellow, inner perianth lobes 8–11 cm long, 2.7–3.4 cm wide, outer perianth lobes 7.8–10.5 cm long, 1.3–1.7 cm wide. Stamens 4–5 cm long, inserted; filament orange-yellow, attached to the base of the perianth tube; anthers ca. 7 mm long, dark brown with purple tint. Style filiform, ca. 9.7 cm long, exserted beyond the stamens; stigma small, capitate, moist. Capsule somewhat large, 2.5–4.1 cm long, 1.7–2.5 cm wide, usually oblong-oval, rarely roundish, cross-wrinkled when dried, surface usually covered with wartlike projections, apex emarginate; seeds shining black, ovoid, angled below, 7 mm long, 5 mm wide. Flowering from late July to August in Korea; fruiting and maturing seed in September.

Because a number of morphological characters found in *Hemerocallis hongdoensis* are shared with synthetic characters of section *Fulvae* (Matsuoka & Hotta, 1966) (e.g., diurnal flowering, orange-yellow perianth, scape with 1–3 scattered bracts, 1–3 dichotomously branched inflorescences, and partly inflated roots), the new species is placed in this section.

Hemerocallis hongdoensis is distinct from other species of *Hemerocallis* by the highly swollen roots lacking a rhizome; deciduous leaves; thick erect scape with ovate-lanceolate bracts (1.2–3.5(–8.0) cm long) below the inflorescence; short (3–9 cm), robust, dichotomous or trichotomous inflorescences; stout perianth tube (ca. 2.4–3.2 cm long, 5.5–6.0 mm wide); perianth lobes obovate with round tip and entire margins; and large-sized fruits (2.5–4.1 cm long, 1.7–2.5 cm wide) usually with wartlike projections.

Hemerocallis hongdoensis grows on rocky cliff-grassland with *Hosta yingeri* S. B. Jones and other herbaceous perennials, at 3–80 m above sea level. The new species has been presumably misidentified and assigned to the *H. littorea* Makino complex by Korean botanists because of its stout scapes, dichotomously branched inflorescences, relatively large flowers, and coastal habitats (Lee, 1985; M. Kim, pers. comm.). *Hemerocallis littorea*, which mostly grows in the coastal areas of western Honshu and southern Kyushu of Japan, is distinct from *H. hongdoensis* by having a well-developed rhizome, evergreen leaves, orange-yellow perianth with a red tinge, and a different flowering period, i.e., September to October versus late July to August for *H. hongdoensis* (in Korea) (Matsuoka & Hotta, 1966; Hotta, 1986).

Hemerocallis hongdoensis appears to be more closely related to *H. aurantiaca* because of its short inflorescence and the size of its perianth lobes. It differs from this species by the underground parts lacking a rhizome, deciduous leaves, orange-yellow perianth color lacking a red tinge, dichotomous or trichotomous inflorescences, 1–2 ovate-lanceolate bracts below the inflorescence which are 1.2–3.5 cm long, and a different flowering period. *Hemerocallis aurantiaca* flowers in May to July and is endemic to the western islands of Kyushu, Japan (Ohwi, 1965).

Hemerocallis hakuunensis Nakai is different from *H. hongdoensis* in having relatively small-sized fusiform-tuberous roots each 1.5–2.0 cm long, usually (1–)2–3(–4)-branched inflorescences which are 5–22 cm long, perianths 6.3–12.3 cm long, inner perianth lobes 1.5–2.7 cm wide, and fruits 2.0–2.3 cm long, 1.1–1.5 cm wide (Chung et al., in press). *Hemerocallis hakuunensis* flowers from mid June to July (August in the mountainous areas) and is endemic to southern, central, and northwestern Korea including Kojae, Namhae, Komun, Bogil, Chin, Anmyeon, and Kangwha Islands (Chung et al., in press).

Korean name. Hongdo-wonch'uri.

Paratypes. KOREA. Chollanam Do, Shinan Gun, Huksan Myeon, Taehuksan Island, on Munam hillside near ocean, 24 Aug. 1919, *Ishidoya & T. Chung 3375, 3390* (TI); Yeri-1-gu, in open area of grassland on rocky cliff near ocean, 15 Aug. 1993, *M. G. Chung & S. S. Kang 2024* (GA, GNUC, MO, TI).

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and Cheju Islands. We especially thank the herbarium directors and curators of GA, KYO, MO, SNU, and TI. This research was supported in part by a National Science Foundation Dissertation Improvement Grant (BSR-8914430) to MGC, a Non Directed Research Fund, from the Korea Research Foundation, 1992, to MGC, and a Korea Science and Engineering Foundation Grant (931-0500-031-2) to MGC.

Literature Cited

Bailey, L. 1930. *Hemerocallis:* The day-lilies. Genetes Herb. 2: 143–156.

Chung, M. G., H. G. Chung & S. S. Kang. Distribution and morphometric analysis of *Hemerocallis hakuunensis* and *H. thunbergii.* Korean J. Pl. Taxon. 23: (in press). [In Korean.]

Cronquist, A. 1981. An Integrated System of Classification of Flowering Plants. Columbia Univ. Press, New York.

Dahlgren, R. M. T., H. T. Clifford & P. F. Yeo. 1985. The Families of the Monocotyledons. Springer-Verlag, Berlin.

Hotta, M. 1986. *Hemerocallis aurantiaca* group in northern Kyushu, Japan. Acta Phytotax. Geobot. 37: 17–21. [In Japanese.]

Hutchinson, J. 1964. The Families of Flowering Plants, Vol. 2. Monocotyledons. Clarendon Press, Oxford.

Kitamura, S., G. Murata & T. Koyama. 1986. Colored Illustrations of Herbaceous Plants of Japan (Monocotyledoneae). Hoikusha Publ., Osaka, Japan. [In Japanese.]

Lee, T. 1985. Illustrated Flora of Korea. Hyangmunsa, Seoul. [In Korean.]

Matsuoka, M. & M. Hotta. 1966. Classification of *Hemerocallis* in Japan and its vicinity. Acta Phytotax. Geobot. 22: 25–43. [In Japanese.]

Nakai, T. 1932. *Hemerocallis* Japonica. Bot. Mag. Tokyo 46: 111–123.

Ohwi, J. 1965. Flora of Japan. Smithsonian Institution, Washington, D.C.

Stout, A. B. 1941. Memorandum on a monograph of the genus *Hemerocallis*. Herbertia 8: 67–71.

Lectotipificación y Nuevo Estatus de *Desmodium orinocense* (Fabaceae: Faboideae)

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RESUMEN. *Desmodium adscendens* (Swartz) DC. var. *orinocense* DC. se ha elevado a nivel de especie como *D. orinocense* (DC.) Cuello, y se le ha designado un lectótipo.

ABSTRACT. *Desmodium adscendens* (Swartz) DC. var. *orinocense* DC. is elevated to species level as *Desmodium orinocense* (DC.) Cuello, and a lectotype is designated.

Durante la preparación del tratamiento de *Desmodium* Desvaux para la *Flora of the Venezuelan Guayana* se observaron diferencias morfológicas notables entre *Desmodium adscendens* (Swartz) DC. var. *adscendens* y *D. adscendens* var. *orinocense* DC., las cuales ameritan un cambio de estatus de la variedad *orinocense* al nivel de especie. El estudio de las descripciones y publicaciones relacionadas a estos dos taxa permitió detectar un error nomenclatural y la ausencia de material tipo para *D. orinocense.*

Humboldt, Bonpland, y Kunth (1824: 520, t. 597) publicaron una descripción e ilustración de un especimen coleccionado al lado del Río Orinoco (Venezuela) identificado erróneamente como *Hedysarum adscendens* Swartz y sin la citación de exsiccata.

Posteriormente, De Candolle (1825: 332), combinó *Hedysarum adscendens* con *Desmodium adscendens* y reconoció dos variedades de esta especie; una de ellas, la variedad *orinocense*, la cual es basada en la misma descripción e ilustración de *H. adscendens* por Humboldt, Bonpland, y Kunth (1824), pero tampoco designó material tipo. De ésto se originó también una confusión en la citación de los autores para este taxón, observándose en algunas publicaciones (Ohashi, 1973) como *D. adscendens* var. *orinocense* (HBK) DC.

Schindler (1927), basándose en colecciones de Venezuela del Río Orinoco (*Humboldt s.n.*) y de Maypure (*Spruce 3569*) [sin herbarios citados], elevó *Desmodium adscendens* var. *orinocense* DC. a nivel de especie, describiéndola como una nueva especie en el género *Nicolsonia* DC., *N. orinocensis* (DC.) Schindler. Este autor tampoco designó ni ubicó material tipo de esta especie. Esta combinación de Schindler (1927) pasa a la sinonimia ya que se considera *Nicolsonia* como un sinónimo de *Desmodium* (Ohashi, 1973). En conformidad con el Art. 7.5 del Código (Greuter et al., 1988) se designa como lectótipo a la ilustración (t. 597) de Humboldt, Bonpland, y Kunth (1823), por ser la primera referencia a esta especie y por la alta calidad y detalles que representa.

Desmodium orinocense (DC.) Cuello, stat. nov.

Basónimo: *Desmodium adscendens* (Swartz) DC. var. *orinocense* DC., Prodr. 2: 332. 1825. Lectótipo: Humboldt, Bonpland & Kunth, Nov. Gen. Sp. 6: t. 597. 1824 (*Hedysarum adscendens* HBK, non Swartz).

Nicolsonia orinocensis (DC.) Schindler, Repert. Spec. Nov. Regni Veg. 23: 358. 1927.

Desmodium orinocense se reconoce principalmente por presentar hojas unifolioladas y trifolioladas en el mismo individuo, los folíolos con el ápice redondeado hasta emarginado y la base subcordada, los lomentos esparcidamente pilosos hasta glabrescentes con venación reticulada prominente, los istmos 2–2.5(–3) mm de ancho, los pedicelos reflexos en la madurez, y por encontrarse frecuentemente sobre afloramientos graníticos (lajas) en la Amazonía colombo–venezolana. Por los caracteres antes mencionados, *D. orinocense* se diferencia de *D. adscendens*, la cual presenta hojas todas trifolioladas, los folíolos con el ápice obtuso hasta redondeado pero no emarginado y la base obtusa o redondeada, los lomentos densamente pilosos con venación no prominente, los istmos 1–1.5 mm de ancho, los pedicelos usualmente erectos en la madurez, y por encontrarse en otras áreas de amplia distribución en los trópicos de Asia, Melanesia, Africa, y América.

Agradecimientos. Se agradece a Bruce Holst, Gerardo Aymard, y Rupert Barneby por la ayuda y orientación en la elaboración de este artículo; a Paul Berry y Roy Gereau por la revisión del ma-

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Literatura Citada

De Candolle, A. P. 1825. Prodromus Systematis Naturalis Regni Vegetabilis, 2. Treuttel & Würtz, Paris.

Greuter, W., H. M. Burdet, W. G. Chaloner, V. Demoulin, R. Grolle, D. L. Hawksworth, D. H. Nicholson, P. C. Silva, F. A. Stafleu, E. G. Voss & J. McNeill. 1988. International Code of Botanical Nomenclature. Regnum Veg. 118.

Humboldt, A., A. Bonpland & S. Kunth. 1823–1824. Nova Genera et Species Plantarum. 6 (ed. cuarta). Lutetiae Parisiorum, Paris.

Ohashi, H. 1973. The Asiatic species of *Desmodium* and its allied genera (Leguminosae). Ginkgoana 1: 1–318, pl., 1–76.

Schindler, A. K. 1927. Desmodii generumque affinium species et combinationes novae. Repert. Spec. Nov. Regni Veg. 23: 353–362.

Pavonia serrana (Malvaceae), a New Species from the State of Minas Gerais, Brazil

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ABSTRACT. A new species of Malvaceae, *Pavonia serrana* G. L. Esteves, is described and illustrated. This species is known only from the Serra da Canastra, Municipality of Botumirim, State of Minas Gerais, Brazil. It is closely related to *P. grazielae* Krapovickas, also from that state. The affinities of the two taxa are discussed.

The genus *Pavonia* Cavanilles includes more than 250 species. In the New World, these species range from the southern United States, through Central America and the Caribbean to South America, where more than half the species occur. The genus also is well represented in the Old World, particularly in Africa (Fryxell, 1979).

Pavonia is placed in the tribe Malvavisceae K. Presl, which is represented in Brazil by the genera *Malvaviscus* Fabricius, *Urena* L., *Malachra* L., *Peltaea* (Presl) Standley, and *Phragmocarpidium* Krapovickas. It may be distinguished from these by a set of characters: the absence of leaf nectaries, petals without auricles, mericarps without glochids, and the presence of an epicalyx with bracteoles that are not differentiated, morphologically or anatomically, into base and blade.

Study of this new species forms a part of the author's doctoral thesis on the species of *Pavonia* of northeastern and southeastern Brazil. This work is ongoing at the Instituto de Biociências of the Universidade de São Paulo, under the supervision of Ana Maria Giulietti.

Pavonia serrana G. L. Esteves, sp. nov. TYPE: Brazil. Minas Gerais: Botumirim, na saída da cidade, em direção à Cachoeira da Noruega, 15 June 1991, *R. Mello-Silva et al. 518* (holotype, SPF; isotypes, SP, CTES). Figure 1.

Frutex 1.5–2 m altus. Indumentum densum, tomentoso-villosum, pilis stellatis longi 5–12 ramosis, pilis glanduliferis sparsis intermixtis compositum. Flores 2.9–4.5 cm longis; epicalyci bracteolae 4–6, orbiculares vel late ovatae, 2.4–3.5 cm longae, 1.5–3.0 cm latae, acutae vel obtusae, basi rotundatae vel profunde cordatae, 9–11 nervatae, marginibus integris pilis stellatis. Carpellum ovoideum, reticulatum, non aristatum, dehiscens. Semina laevia.

Shrub 1.5–2 m tall. Indument tomentose to villous, extremely dense and thick, composed of stellate pedunculate trichomes with 5–12 arms mixed with sparse glandular trichomes. Branches glabrescent at the base, wine-colored. Leaf blades 4.5–13.5 cm long, 5.8–11.5 cm wide, broadly ovate to suborbicular, frequently subtrilobate, acute at the apex, deeply cordate at the base, margins slightly serrate or entire, basal nerves 9–11; discolorous, the adaxial surface wine-colored to blackish, glabrescent, the abaxial surface densely velutinous with yellowish indument; petioles (2.2–)3.5–7 cm long; stipules linear-subulate. Flowers solitary, axillary, grouped at the ends of the branches where the leaves are fewer in number; pedicels slightly articulated 10–15 mm below the calyx; bracteoles of the epicalyx 4–6, 2.4–3.5 cm long, 1.5–3 cm broad, orbicular to broadly ovate, acute to obtuse at the apex, rounded to deeply cordate at the base, longitudinal nerves 9–11, margins entire, with stellate trichomes; calyx 1.8–2 cm in length, tubular to cup-shaped, shortly lobed; petals 2.9–4.5 cm long, 0.75–1.5 cm broad, narrowly obovate, yellow to red with yellow to red nerves, unguiculate, the claws adnate to the base of the staminal tube; staminal tube 3–4.2 cm long, twisted, 5-toothed at the apex, anthers 45–65, the filaments partly free at the distal end of the tube; styles 3.2–4.5 cm long. Mericarps trigonous, ovoid, venation reticulate, prominent except at points of contact, dehiscent; seeds smooth.

Pavonia serrana is characterized principally by the indument, which varies from tomentose to villous and is extremely dense and thick. It is composed of stellate pedunculate trichomes, with 5 to 12 arms, mixed with sparse glandular trichomes. Also distinctive is the epicalyx, formed by 4 to 6 orbiculate or broadly ovate bracteoles with 9 to 11 longitudinal nerves and margins entire, with stellate trichomes.

Pavonia serrana is so far known only from collections made in the Serra da Canastra, near Botumirim (northern Minas Gerais). In this region there are numerous populations in the *cerrados* at the foot of the *serra*, and rather fewer occurrences on the stony slopes higher up.

The species belongs to the group formed by *Pa-*

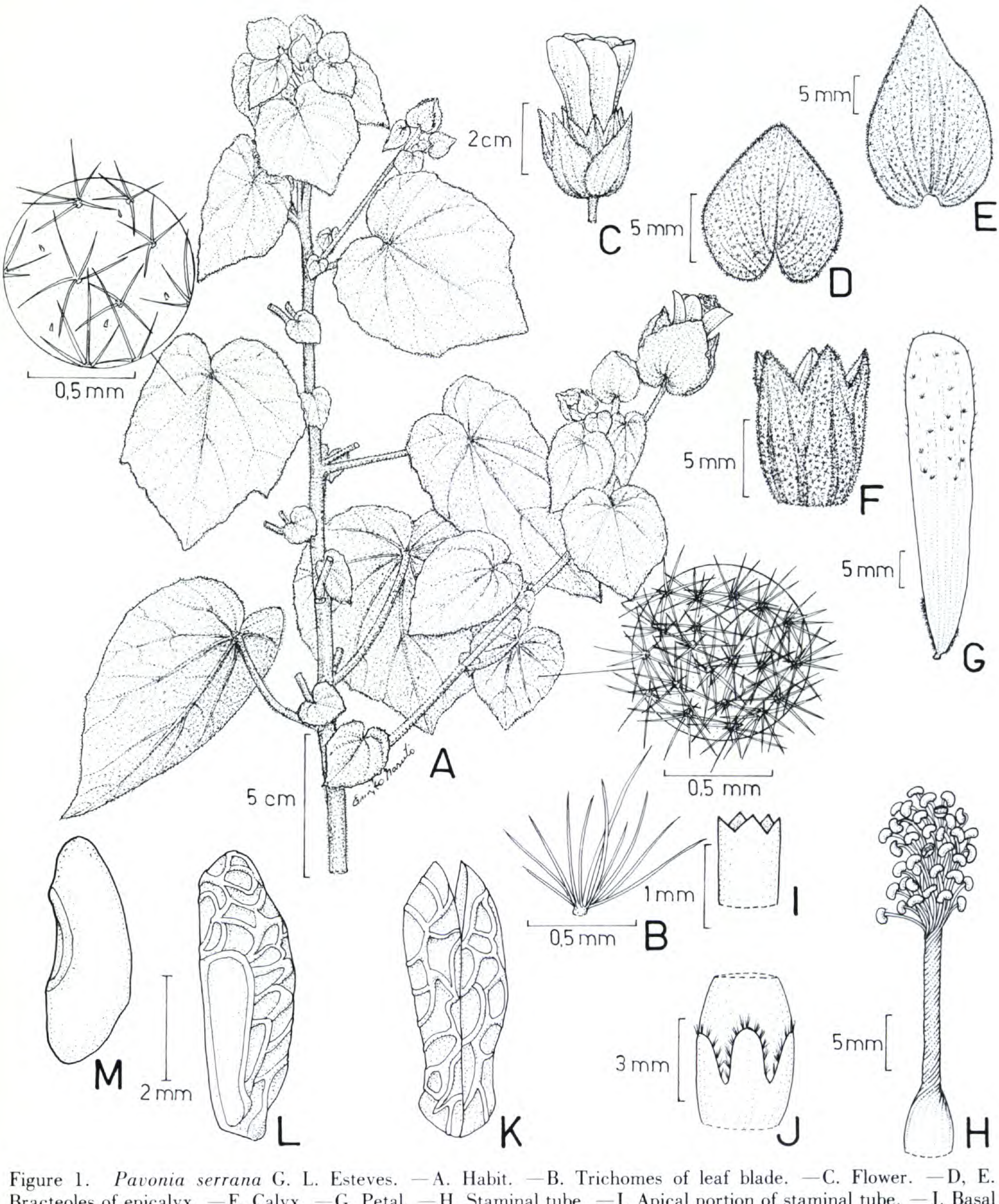

Figure 1. *Pavonia serrana* G. L. Esteves. —A. Habit. —B. Trichomes of leaf blade. —C. Flower. —D, E. Bracteoles of epicalyx. —F. Calyx. —G. Petal. —H. Staminal tube. —I. Apical portion of staminal tube. —J. Basal portion of staminal tube, showing point of contact between petals and tube. —K, L. Mericarps, dorsal and lateral views. —M. Seed.

vonia malvaviscoides St. Hilaire, *P. viscosa* St. Hilaire, *P. aschersoniana* Guerke, and *P. grazielae* Krapovickas. The group is characterized by the leaves, which are ovate to orbiculate and discolorous; by the tubular flowers, generally pendent and yellow to red in color; and by the non-aristate mericarps, with prominent reticulate veins and smooth seeds.

This group of species is endemic to forests and open stony habitats on mountains in the Espinhaço Range, State of Minas Gerais (Guerke, 1892; Krapovickas, 1978; Esteves, 1986).

Pavonia serrana is most closely related to *P. grazielae* Krapovickas, particularly in the number and form of the bracts of the epicalyx; it differs,

TABLE 1. Morphological comparison of *Pavonia grazielae* Krapovickas and *P. serrana* G. L. Esteves.

	P. grazielae	*P. serrana*
Stem indument	pubescent, mostly sparsely glandular trichomes	tomentose-villous, mostly stellate, forming a dense thick layer
Leaf length (cm)	4–10.5	4.5–13.5
Leaf width (cm)	3–7.5(–9.6)	5.8–11.5
Leaf margin	serrate to crenate	slightly serrate or smooth
Orientation of leaves	hanging	spreading
Petal length (cm)	2.5–3.8	2.9–4.5
Number of bracteoles	4–7	4–6
Bracteole length (cm)	1.6–2.7	2.4–3.5
Bracteole width (cm)	0.9–1.7	1.5–3
Bracteole shape	always ovate	orbiculate to broadly ovate
Number of nerves	7–9	9–11
Bracteole margins	entire, stellate, glandular and sparse simple trichomes	entire, stellate trichomes
Calyx trichomes	glandular, simple and stellate	glandular and stellate

however, principally in the indument, the leaves, and the flowers (see Table 1).

Paratype. BRAZIL. **Minas Gerais:** Botumirim. Tinoco, próximo à estrada para Itacambira, 15 June 1991, *R. Mello-Silva et al. 500* (SP, SPF, CTES).

Literature Cited

Esteves, G. L. 1986. A Ordem Malvales na Serra do Cipó, Minas Gerais, Brasil. Dissertação de mestrado, Universidade de Sáo Paulo.

Fryxell, P. 1979. Una revisión del género *Pavonia* en México. Bol. Soc. Bot. México 38: 7–34.

Guerke, M. 1892. Malvaceae II. *In:* C. F. P. Martius (editor), Flora Brasiliensis 12(3): 458–598, tabs. 81–114.

Krapovickas, A. 1978. Una nueva especie de *Pavonia* (Malvaceae) del estado de Minas Gerais, Brasil. Revista Brasil. Bot. 1: 89–91.

New Taxa and Combinations in Chinese Primulaceae

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ABSTRACT. Two new taxa, *Lysimachia tsaii* and *L. henryi* var. *guizhouensis*, are described, and three new combinations, *L. kwangtungensis* (Handel-Mazzetti) C. M. Hu, *Primula tardiflora* (C. M. Hu) C. M. Hu, and *P. melanantha* (Franchet) C. M. Hu, are proposed.

The following new taxa and nomenclatural adjustments are herein presented in order to make the names available for the forthcoming volume 15 of the *Flora of China*.

Lysimachia tsaii C. M. Hu, sp. nov. TYPE: China. Yunnan: Langping Xian, in ravines, alt. 2,800 m, *H. T. Tsai 56213* (holotype, A).

Herba perennis 30–50 cm alta. Caulis erectus, obtuse quadrangularis, superne saepe ramosus et glandulosus. Folia subopposita, lanceolata vel lineari-lanceolata, 2.5–7 cm longa, 0.3–1.4(–1.8) cm lata, glabra, secus marginem glanduloso-punctata et striolata, basi cuneato-attenuata, margine crispo-undulata, apice caudato-acuminata, nervis lateralibus 5 vel 6 paribus; petiolus ca. 5 mm longus. Inflorescentia racemosa, terminalis, 3–8 cm longa; bracteae subulato-lanceolatae pedicelis aequantes vel paulo superantes. Pedicelli 2.5–3.5 mm, glandulosi. Calyx ca. 5 mm longus, fere ad basin in lobos lineari-lanceolatos lineis duabus glandulosis fuscis obsitos fissus. Corolla rosea, 7.5–8.5 mm longa, tubo ca. 2 mm longo, lobis oblongo-lanceolatis, 3–3.2 mm latis, saepe glanduloso-striatis. Stamina corollam aequantia vel paulo superantia, filamentia basi loborum corollae adnata; antherae ellipticae, ca. 1 mm longae. Ovarium glabrum; stylus ca. 7 mm longus. Capsula globosa, ca. 2.5 mm diametro, brunnea.

Perennial herbs, 30–50 cm high. Stems erect, obtusely quadrangular, often branched and glandular above. Leaves subopposite, lanceolate to linear-lanceolate, 2.5–7 cm long, 0.3–1.4(–1.8) cm wide, glabrous, green adaxially, paler abaxially, glandular punctate and striolate along margin, base cuneate-attenuate, margin crisped-undulate, apex caudate-acuminate; lateral veins 5 or 6 pairs, midvein elevated abaxially; petiole ca. 5 mm long, narrowly margined. Inflorescence terminal racemes 3–8 cm long; bracts subulate-lanceolate, as long as to slightly longer than pedicel. Pedicels 2.5–3.5 mm long, to 5 mm in fruit, glandular. Calyx ca. 5 mm long, divided to base into linear-lanceolate lobes with dark brown lines. Corolla rose, 7.5–8.5 mm long, tube ca. 2 mm long; lobes oblong-lanceolate, 3–3.2 mm wide, often glandular striate, apex rounded, sinus ± obtuse. Stamens as long as corolla or slightly longer; filaments adnate to base of corolla lobes, free part glabrous; anthers elliptic, ca. 1 mm long. Ovary glabrous. Style ca. 7 mm long. Capsule globose, brown, ca. 2.5 mm diam.

Lysimachia tsaii is distinguished from the related *L. taliensis* Bonati by its subopposite leaves with crisped-undulate margin and glandular striate corolla lobes. The latter, which is also endemic to Yunnan, has entire leaves in whorls of 3 or 4, but opposite on branches, and eglandular corollas.

Paratypes. CHINA. **Yunnan:** Longping Xian, by stream, alt. 3,000 m, *H. T. Tsai 53797* (IBSC), *H. T. Tsai 57549* (IBSC).

Lysimachia henryi var. **guizhouensis** C. M. Hu, var. nov. TYPE: China. Guizhou: Jingkou Xian, Tongkuangchang, river flood plain and adjacent mixed deciduous broad-leaved evergreen forest, alt. 900 m, *Sino-American Guizhou Bot. Exped. 548* (holotype, A).

Herba perennis. Caulis 10–18 cm altus, pilis multicellularibus obsitus. Folia opposita, lanceolata, rare elliptica vel ovato-elliptica, (1.2–)2.5–6 cm longa, 0.5–1.5 cm lata, supra sparse subtus sparsissime vel vix setulosa. Pedicelli 2–5(–6) mm longi, sparse pilosi. Calyx ca. 7 mm longus fere ad basin in lobos lanceolatos acuminato glandulis pellucidis obsitos fissus, extus ut pedicelli indutus. Corolla lutea, ca. 13 mm longa, lobos obovatos ca. 8 mm latos, apice rotundatos fissa, glandulis ecoloribus obsita. Filamenta in tubum ca. 3 mm altum supra densissime glandulosum connata, partibus liberis 3–4 mm longis. Stylus ca. 6 mm longus.

Perennial herbs. Stem often prostrate and radical part erect, 10–18 cm high, covered with multicellular hairs. Leaves opposite, lanceolate, rarely elliptic to ovate-elliptic, (1.2–)2.5–6 cm long, 0.5–1.5 cm wide, papery, sparsely setulose adaxially, sparsely or scarcely setulose abaxially, base gradually narrowed into petiole 4–6 × shorter than blade; midrib prominent abaxially, lateral veins inconspicuous. Flowers 3–8, in umbellate-subcapitate inflorescence. Pedicels 2–5(–6) mm long, sparsely pilose. Calyx ca. 7 mm long, divided to base into lanceolate acu-

minate lobes covered with translucent glands. Corolla yellow, ca. 13 mm long, lobes obovate, ca. 8 mm wide, apex split into rounded halves, glandular. Filaments connate at base into a tube ca. 3 mm long, densely glandular, free part 3–4 mm long; anthers linear-oblong, ca. 2 mm long. Ovary pilose on upper half. Style ca. 6 mm long.

Lysimachia henryi var. *guizhouensis* differs from variety *henryi* in having ± minutely setulose instead of glabrous or abaxially pilose leaves.

Paratypes. CHINA. **Guizhou:** Jingkou Xian, Heiwan River, SE side of the Fanjing Shan mountain range, alt. 650–800 m, rooting in crevices on mossy ledges along river, *Sino-American Guizhou Bot. Exped. 121* (A); Songtao Xian, vicinity of Lengjiaba, NE side of the Fanjing Shan mountain range, alt. 820–1,120 m, growing in thin soil on rock outcrop on forest slope, *Sino-American Guizhou Bot. Exped. 2307* (A).

Lysimachia kwangtungensis (Handel-Mazzetti) C. M. Hu, comb. et stat. nov. Basionym: *Lysimachia congestiflora* Hemsley var. *kwangtungensis* Handel-Mazzetti, Notes Roy. Bot. Gard. Edinburgh 16: 168. 1931. TYPE: China. Guangdong: Shiuchou region, *To Kang Peng & Groffe 2858* (holotype, W; isotype, CAS).

Perennial herbs. Stems erect, 15–30 cm high, simple or often branched above, with reddish multicellular hairs. Leaves opposite, ovate-lanceolate to lanceolate, 1.5–7 cm long, 1–2.2 cm wide, sparsely setulose on both sides, rarely glabrescent, translucent glandular-dotted throughout and densely so along margin, base narrowly cuneate, apex acuminate; lateral veins 3 pairs, slender, oblique; petiole 4–10 mm long, narrowly margined, subamplexicaul. Flowers 4–10, congested at stem apex; bracts ovate, ciliate. Pedicels ca. 5 mm long. Calyx divided almost to base into lanceolate lobes 5–6 mm long, 0.6–1 mm wide, pubescent outside. Corolla yellow, tube ca. 1 mm long; lobes oblong-elliptic, 8–9 mm long, 5–5.5 mm wide, obtuse, anterior glandular red to dark purple. Filaments connate into a tube ca. 2 mm long, free parts 2–3 mm long; anthers oblong, ca. 1.2 mm long. Ovary pilose on upper half. Style 5–6 mm long. Capsule subglobose, 3.5–4 mm diam., brown.

In its overall aspects, leaves, and habit, *Lysimachia kwantungensis* shows some affinity to *L. hemsleyi* Franchet and *L. fistulosa* Handel-Mazzetti. It is readily distinguished from these by its red or dark purple punctate corolla lobes.

Additional specimens examined. CHINA. **Guangdong:** Ruyuen Xian, by streams, alt. 200 m, *S. H. Chun 1384* (IBSC); Yangshan Xian, on rocks in valleys, *L. Teng 1346* (IBSC); roadsides near water, alt. 600–700 m, *Y. C. Tseng 170398* (IBSC). **Hunan:** Hen Shan, in shade place, alt. 525 m, *S. H. Chun 3494* (IBSC).

Primula tardiflora (C. M. Hu) C. M. Hu, comb. et stat. nov. Basionym: *P. ovalifolia* subsp. *tardiflora* C. M. Hu, Fl. Reipubl. Popularis Sin. 59(2): 292. 1990. TYPE: China. Sichuan: Emei Shan, in deciduous broad-leaved forest, alt. 2,000–2,500 m, *K. H. Yang 54421* (holotype, IBSC).

Perennial efarinose herbs. Rhizomes short, thick, covered with ovate to oblong-ovate scales 1–3 cm long. Leaves broadly obovate to broadly elliptic, (3–)5–9 cm long, 2.5–6 cm wide, ± accrescent after anthesis, papery, adaxially glabrous, abaxially pubescent along veins, glabrous elsewhere, base attenuate to narrowly decurrent, margin hydathode dentate, apex rounded; lateral veins 10–12 pairs; petiole as long as blade or shorter, narrowly winged. Scape 5–12 cm long, to 18 cm in fruit, sparsely brownish pubescent; umbel solitary, 3–6-flowered; bracts linear-lanceolate, 3–5 mm long. Pedicels 7–12 mm long, to 2 cm in fruit, sparsely pubescent. Calyx campanulate, 9–10 mm long, puberulent outside, divided to middle into lanceolate acute lobes. Corolla heterostylous, pale purple, with white eye; tube slightly longer than calyx; limb 2–2.5 cm diam., lobes oblong-ovate, emarginate. Stamens of long-styled flowers inserted at middle of corolla tube, those of short-styled flowers inserted a little lower. Ovary globose. Short styles reaching middle of corolla tube, long styles exserted. Capsule not seen.

Primula tardiflora is a rare species apparently confined to a small area on Mt. Emei. It superficially resembles *Primula ovalifolia* Franchet, but can be distinguished by its leaves with attenuate base and sparsely pubescent veins. *Primula ovalifolia* occurs at low elevations on Mt. Emei and reaches its upper altitudinal limit at 1,700 m, while *P. tardiflora* grows at higher altitudes (2,000–2,500 m), and it flowers from the end of April to May, about one month later than *P. ovalifolia*.

Additional specimens examined. CHINA. **Sichuan:** Emei Shan, in deciduous broad-leaved forest, alt. 2,100–2,400 m, *K. H. Yang 54324, 55168, 55259* (IBSC), *T. H. Hsiung, S. S. Chang & H. L. Tsiang 30166* (IBSC), *W. P. Fang 231* (IBSC), *S. L. Sun 1865* (IBSC).

Primula melanantha (Franchet) C. M. Hu, comb. et stat. nov. Basionym: *P. nivalis* Pallas var. *melanantha* Franchet, J. Bot. (Morot) 9: 449. 1895. TYPE: China. Sichuan: Kangding Xian (Tatsien-lou), Zhe-duo Shan, *Soulie 516bis* (holotype, P).

Perennial herbs. Rhizomes short, thick, densely covered with imbricate, persistent, ovate-lanceolate scales 2–6 cm long. Leaves oblanceolate, 5.5–12 cm long, 1.5–3 cm wide, gradually narrowed to base, margin crenate-denticulate, adaxially densely pubescent, abaxially sparsely or scarcely pubescent; midvein broad, prominent, lateral veins slender, inconspicuous; petiole broadly winged, much longer than basal scales at about anthesis. Scapes 25–40 cm high, puberulent, ± white farinose near apex; umbel simple, many flowered; bracts 7–10 mm long, basal ones triangular, subulate-acuminate. Pedicels 1–3 cm long. Calyx campanulate, 8–9 mm long, divided to middle or above into lanceolate, acute, ciliolate lobes. Corolla heterostylous, dark purple; tube of long-styled flowers 8–9 mm long, that of short-styled flowers 11–12 mm long; limb 1–1.3 cm diam.; lobes oblong to oblong-elliptic, 6–9 × 2–4.5 mm, puberulent on both sides, apex obtuse to ± acute. Stamens of long-styled flowers inserted at basal 3 mm of corolla tube, those of short-styled flowers inserted near tube apex. Ovary globose. Long styles slightly exserted from corolla tube, short styles reaching middle of corolla tube. Capsule not seen.

Although originally described as a variety of *Primula nivalis* Pallas and later associated with *P. limbata* Balfour f. & Forrest and *P. russeola* Balfour f. & Forrest, *P. melanantha* is much closer to *P. purdomii* Craib on account of its habit. It differs from all the above-mentioned species by its pubescent leaves and much smaller flowers.

Additional specimens examined. CHINA. **Sichuan:** Kangding Xian (Tatsien-lou), Zhe-duo Shan, *Souli 2234, 3121* (P).

Acknowledgment. I am grateful to Ihsan Al-Shehbaz for his help in the preparation of the manuscript.

A New Name for the Australian Orchid *Prasophyllum chasmogamum* R. Bates & D. L. Jones (Orchidaceae)

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ABSTRACT. The name *Prasophyllum correctum* D. L. Jones replaces *P. chasmogamum* R. Bates & D. L. Jones, the latter being based on an incorrect selection of a type.

Prasophyllum chasmogamum R. Bates & D. L. Jones was described from material collected beside the railway line about 6 km west of Bairnsdale, Victoria, Australia (Jones, 1991), but the wrong specimen was inadvertently designated as the type. Collectors familiar with the orchid flora of the railway line west of Bairnsdale have pointed out that the taxon intended to be described did not occur in the locality, whereas two other species of *Prasophyllum*, namely *P. pyriforme* E. Coleman and *P. frenchii* F. Mueller, were present (J. Jeanes, pers. comm.; R. Clark, pers. comm.). A critical examination of the type of *P. chasmogamum* showed it to be identical with material of *P. pyriforme*. Thus *P. chasmogamum* becomes a synonym of *P. pyriforme*, and the overlooked taxon is here described as new.

Prasophyllum pyriforme E. Coleman, Victorian Naturalist 49: 195, t. 14. 1932. TYPE: Australia. Wonga Park, Doncaster, Oct. 1931, *F. Bullock s.n.* (holotype, MEL).

Prasophyllum chasmogamum R. Bates & D. L. Jones in D. L. Jones, Austral. Orchid Res. 2: 77. 1991. TYPE: Australia. About 6 km W of Bairnsdale, beside railway line, 5 Nov. 1969, *T. B. Muir 4765* (holotype, MEL).

Prasophyllum correctum D. L. Jones, sp. nov. TYPE: Australia. Victoria: near Munro, 5 Nov. 1992, *J. Jeanes* (*D. L. Jones 10689*), (holotype, MEL; isotype, CBG). Figure 1.

Prasophyllum fusco R. Brown affinis, sed floribus late aperientibus columna exposita, labello late ovato-lanceolato basi latissimo disciforme, et calli aliquantum irregulariter marginato differt.

Slender terrestrial tuberous herb 15–40 cm tall. Tuberoids ovoid, 6–10 mm across. Leaf 12–30 cm long, dark green, base 3–5 mm across, red to purple, free lamina suberect, often withered at anthesis. Floral bracts ovate, ca. 4 × 2 mm, apiculate. Ovary obovoid, ca. 4 × 2 mm, shiny green, set at ca. 30° to the rhachis. Inflorescence a narrow loose spike 5–10 cm long, consisting of 10–20 flowers. Flowers 7–9 mm across, predominantly yellowish green and light reddish brown, opening widely, fragrant, sessile. Dorsal sepal linear-ovate, 7–9 × ca. 3 mm, green with brown striae, nearly vertical, subacute to acuminate. Lateral sepals linear-lanceolate, 7–9 × 1.5–2 mm, connate throughout, partially united or free from the base, erect or recurved, subacute, anterior margins involute throughout. Petals linear to linear-lanceolate, 7–9 × 1–1.2 mm, green with brown striae, upswept, incurved to widely spreading, subacute. Labellum broadly ovate-lanceolate in outline when flattened, 6–8 × 3.5–4 mm, yellowish green, erect, narrowed to a short basal claw, not gibbous when viewed from the side, proximal half almost orbicular, obliquely erect, flat with entire margins, distal half recurved, with entire or slightly crenulate margins, the apex touching the sepals or protruding through them, apiculate; callus elliptical-lanceolate, 5–6 × 2–2.5 mm, raised, fleshy, green, channeled centrally, margins entire or crenate, narrowed beyond the bend and extending nearly to the labellum apex. Column ca. 3 × 3 mm, porrect from the end of the ovary, exposed by the wide expansion of the tepals; appendages linear-oblong, ca. 2.3 × 0.7 mm, pale green, truncate or emarginate. Anther ovate, ca. 2 × 1.6 mm, dark red brown. Pollinarium ca. 2 mm long; viscidium ovate, ca. 0.25 mm long, white; hamulus ca. 0.2 mm long, ligulate; pollinia linear-clavoid, ca. 1.6 mm long, yellow, sectile. Stigma quadrate, ca. 1.5 × 1.5 mm, the rostellum about as high as the appendages. Capsule obovoid, ca. 5 × 3 mm, shiny green.

Flowering period. October and November.

Distribution and habitat. Apparently endemic in grassland and woodland in southeastern Victoria, Australia, particularly around Bairnsdale, and with an old record from Marlo. The species is now confined to small areas in railway reserves, growing in grassland dominated by *Themeda australis*. Soils are mainly gray-brown clay loams.

Notes. Prasophyllum correctum can be readily distinguished from its congeners, particularly *P. fus-*

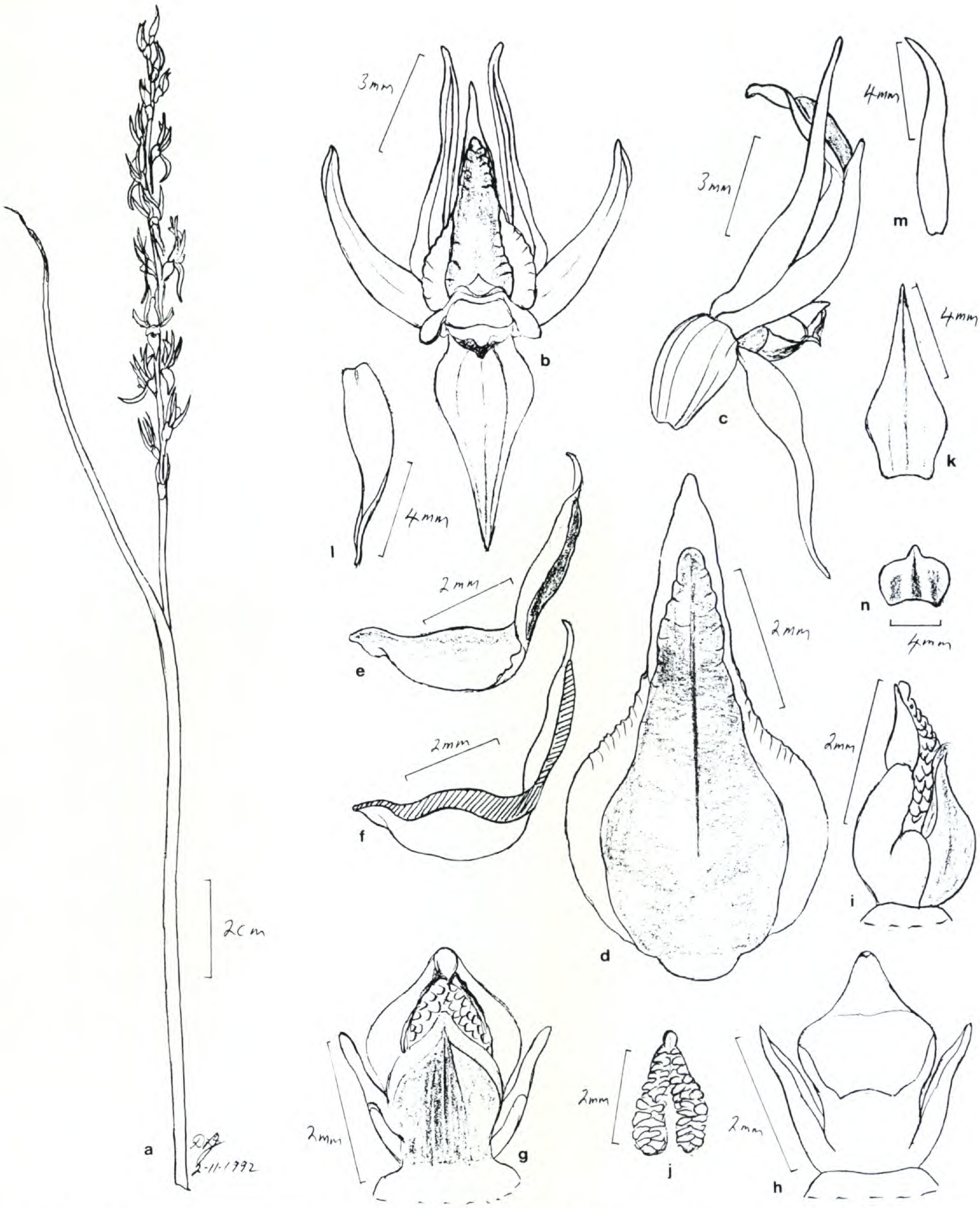

Figure 1. *Prasophyllum correctum* D. L. Jones, near Munro, *D. L. Jones 10689*. —a. Plant. —b. Flower from front. —c. Flower from side. —d. Labellum from above, flattened out. —e. Labellum from side. —f. Longitudinal section of labellum. —g. Column from rear. —h. Column from front. —i. Column from side. —j. Pollinarium. —k. Dorsal sepal. —l. Lateral sepal. —m. Petal. —n. Fertile bract.

cum R. Brown, by its widely opening flowers in which the labellum is nearly erect (and often strongly recurved) and the column is exposed; the broadly ovate-lanceolate labellum with its very broad, disc-like base; and the broad, thick callus with somewhat irregular margins. The species has now been reduced to rarity, with an estimated population of less than 100 plants.

Conservation status. Rare, endangered, and not conserved; suggest 2E by criteria of Briggs & Leigh (1988).

Etymology. From the Latin, "correctus," correct, made right.

Paratypes. All AUSTRALIA. **Victoria:** ca. 3.2 km E of Munro, 24 Oct. 1987, *R. Bates 11394* (AD); Marlo, (no date), *W. Hunter* (*W. H. Nicholls 625-630*) (MEL); Bairnsdale, Nov. 1930, *T. S. Hart* (*W. H. Nicholls 173, 174*) (MEL); Bairnsdale, 18 Oct. 1938, *W. Hunter* (*W. H. Nicholls 686-690*) (MEL); Bairnsdale, on open grassy plains, Nov. 1941, *W. Hunter* (*W. H. Nicholls 798, 799*) (MEL); Lindenow, on railway line, 18 Oct. 1970, *D. L. Jones s.n.* (MEL).

Acknowledgments. I thank Jeff Jeanes and Ruth Clark for bringing the problems associated with the description of *Prasophyllum chasmogamum* to my attention, Tim Entwisle for discussions, arranging the loan of specimens from MEL, and for reading the manuscript, and Mark Clements for commenting on the manuscript.

Literature Cited

Briggs, J. D. & J. H. Leigh. 1988. Rare or Threatened Australian Plants. Australian National Parks and Wildlife Service, Special Publication No. 14.

Jones, D. L. 1991. New taxa of Australian Orchidaceae. Austral. Orchid Res. 2: 1–208.

A New Species of *Dendrobium* Section *Rhizobium* (Orchidaceae) from Australia

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ABSTRACT. *Dendrobium brevicaudum* D. L. Jones & M. Clements is described for the forthcoming orchid volume of the *Flora of Australia*.

The genus *Dendrobium* Swartz in Australia comprises about 60 species distributed mainly in north-eastern Queensland, with about 16 species in the section *Rhizobium* (Clements, 1989). A distinctive new species of this section is described here as new.

Dendrobium brevicaudum D. L. Jones & M. Clements, sp. nov. TYPE: Australia. Queensland: Cook District, Mt. Finnigan, S of Cooktown, 31 Mar. 1993, *C. H. Broers 422 & L. J. Roberts* (holotype, CBG; isotypes, CBG, BRI). Figure 1.

Dendrobium brevicaudum D. L. Jones & M. Clements, species nova, *D. dolichophylli* D. L. Jones & M. Clements affinis, a qua floribus flavo-brunneis fragrantissimis, sepalis latioribus, sepalis lateralibus prope labellum curvatis, columna pubescente, et labello pubescente apice brevissimo differt.

Pendulous epiphyte forming slender clumps to 2 m or more long. Aerial roots absent. Stems straight, 10–20 cm × 2–2.5 mm, becoming yellow-brown on senescence. Old plants consist of 1 or 2 stems, leafless in proximal half, much-branched and leafy in distal half. Leaves linear-terete, 15–60 cm × 3.5–5 mm, linear-terete, pendulous, dark green. Racemes 4–6 cm long, wiry, arising singly from nodes at the leaf base, bearing 5–8 flowers. Pedicels 9–12 mm long, filiform. Ovary 1–2 mm long, hardly developed at anthesis. Flowers about 4.5 cm across, opening widely, strongly fragrant, dull yellowish to brownish yellow, with short dark reddish striae at the base of the sepals and a whitish labellum with fine purple markings and a darker callus. Dorsal sepal narrowly elliptical-lanceolate, 17–20 mm × 3.3–4 mm, slightly constricted near the base, erect to obliquely erect, apex obtuse. Lateral sepals asymmetrically lanceolate, 14–16 mm × 4.5–5.5 mm, strongly falcate, divergent but the inner base closely supporting the labellum, apex subacute, cymbiform. Petals narrowly linear-lanceolate, 18–20 mm × 2–2.5 mm, obliquely erect, spreading or incurved. Labellum whitish, 16–19 mm × 6–7 mm when flattened, pubescent, porrect in the proximal half, recurved in the distal half; lateral lobes 10–12 mm × ca. 2 mm, erect and column-embracing, constricted before the erect narrow-triangular, free portion which is ca. 2.5 mm long; mid-lobe 6–9 mm × 5–6 mm, widest toward the middle then tapered to a short caudiform apex, lateral margins intensely sinuate-crisped nearly to the apex; callus of 3 dark reddish ridges, straight and parallel on the basal lobe, becoming irregularly sinuate on the mid-lobe, extending as faint lines nearly to the apex. Column 5–6 mm × 2.5–3 mm, porrect from the end of the ovary, anterior surface and margins pubescent; foot 4–4.5 mm × ca. 2 mm, at about 120° to the column, channeled, ventral surface pubescent. Stigma ca. 2 mm × 1.5 mm, deeply sunken. Anther ca. 4 mm × 2 mm, concave, with a short, decurved, scabrid rostrum. Pollinia ca. 1 mm long, clavate, falcate, orange, waxy. Capsule not seen.

Flowering period. December and January.

Distribution and habitat. Restricted to north-eastern Queensland, where mainly occurring on Mt. Finnigan and with a single reported sighting from Mt. Misery (L. Roberts, pers. comm.). The species grows in shady conditions on trees and rocks in rainforest and tall cloud forest above about 700 m altitude.

Affinities. Dendrobium brevicaudum is a distinctive species with no obvious links to any other Australian species of section *Rhizobium*. The plants have a pendulous growth habit similar to those of *D. dolichophyllum* D. L. Jones & M. Clements but with shorter leaves, and the stems lack aerial roots. Florally the new species can be immediately recognized by its relatively small, yellow-brown to orange-brown, strongly fragrant flowers, broad sepals with the lateral sepals curved close to the labellum, and the labellum with a very short, caudate apex. It is the only Australian species of this section known to the authors to have short hairs on the labellum, column, and column foot.

Conservation status. Dendrobium brevicaudum is relatively restricted in its distribution but is locally common; it is conserved in the Cedar Bay National Park and is not threatened at present.

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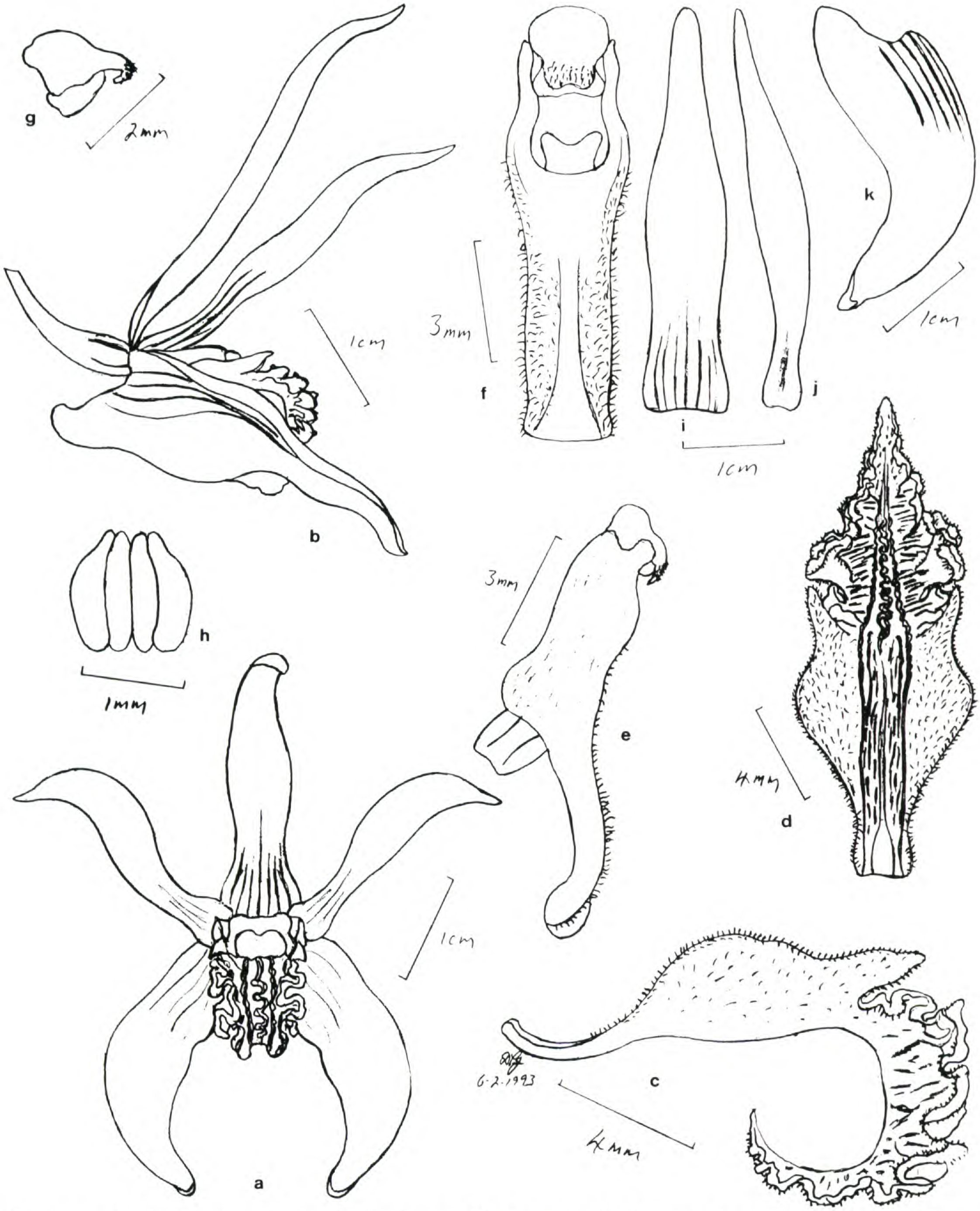

Figure 1. *Dendrobium brevicaudum* D. L. Jones & M. Clements, Mt. Finnigan, *L. J. Roberts s.n.* —a. Flower from front. —b. Flower from side. —c. Labellum from side. —d. Labellum from above, flattened out. —e. Column from side. —f. Column from front. —g. Anther cap from side. —h. Pollinarium. —i. Dorsal sepal. —j. Petal. —k. Lateral sepal.

Etymology. From the Latin "brevis," short, and "cauda," a tail, in reference to the abbreviated labellum apex.

Acknowledgments. We thank Len Lawler and Lewis Roberts for bringing the species to our attention, Corinna Broers for making the type collection, Alex George for the Latin diagnosis, and Barbara Jones for processing the manuscript.

Literature Cited

Clements, M. A. 1989. Catalogue of Australian Orchidaceae. Austral. Orchid Res. 1: 1–160.

Miconia alainii (Melastomataceae: Miconieae), a New Species from Hispaniola

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ABSTRACT. *Miconia alainii*, which is known only from a diverse cloud forest near the summit of Loma Trocha de Pey or "Monteada Nueva," the easternmost peak of the Sierra de Baoruco of the Dominican Republic, is described and illustrated. It is compared to *M. adenocalyx* and *M. favosa*, two phenetically similar species.

In the course of fieldwork in connection with a monograph of the Antillean members of *Miconia* sect. *Chaenopleura* Bentham & J. D. Hooker, a new species of *Miconia* was collected. Its placement in *Miconia* is clear due to the following combination of features: the presence of druse crystals, an indumentum of irregularly stellate-branched hairs, terminal cymes of numerous, ± small fruits, five distinct and small internal calyx lobes, and five small external calyx lobes (see Judd & Skean, 1991). Although this species is known only from fruiting and vegetative collections, it is probably referable to *Miconia* sect. *Chaenopleura* (see Cogniaux, 1891). Section *Chaenopleura* is a distinctive, and presumably monophyletic group possessing an actinomorphic androecium (i.e., stamens forming a radially symmetrical pattern around the style) of white stamens of which the obovate anthers open by longitudinal slitlike pores (Judd & Beaman, 1988; Judd & Skean, 1991). The group is also characterized by an indumentum of ferrugineous, ± irregularly stellate-branched hairs, globose fruits that turn from red to blue (or blue-white) at maturity, and angular-obovoid seeds with a ± smooth testa (Judd & Skean, 1991, fig. 10B). Most Hispaniolan species of *Miconia* belong to this section, and many are narrow endemics. The new species is described below and compared with several phenetically similar Hispaniolan species of *Miconia*. It is presumably limited to the cloud forests of the eastern Sierra de Baoruco.

Miconia alainii Judd & Skean, sp. nov. TYPE: Dominican Republic. Prov. Barahona: Sierra de Baoruco, Caña Brava, Monteada Nueva, 1,300 m, 24 Apr. 1976 (fr), *A. H. Liogier & P. Liogier 25179* (holotype, JBSD). Figure 1.

Species haec a *Miconia adenocalyce* Urban & Ekman differt foliis majoribus 8.5–16 × 5.2–10.5 cm (nec 2.8–14 × 1.4–5.6 cm), venis secundariis intimis a folio margine 10–23 mm (nec 2.5–9 mm), et inflorescentiis axibus, hypanthio et calyce pilis et glandulifis longis-stipitatis destitutis.

Shrubs to 3 m tall. *Indumentum* of multicellular, darkly ferrugineous, stellate- or irregularly branched to globular-stellate or elongate short-branched hairs, and minute globular hairs. *Young twigs* not ridged, ± rectangular in cross section, becoming terete with age, the indumentum of dense, elongate short-branched to globular-stellate hairs, these ± persistent; internodes 2–10(–15) cm long. *Leaves* with petiole 2.9–7.5 cm long, the indumentum same as that of twigs; blade ovate, 8.5–16 × 5.2–10.5 cm, coriaceous, the apex acuminate, the base cordate, the margin plane, entire to sparsely and obscurely to clearly dentate, i.e., proximal 0–70% of margin entire, the largest teeth 0.1–1.4 mm long; venation acrodromous, with prominent midvein and 6 secondary veins, with 4 conspicuous secondary veins, the inner pair placed ca. 10–23 mm in from margin, and 2 inconspicuous secondary veins closer to margin, and numerous percurrent tertiary veins oriented subperpendicular to midvein, joined by percurrent-orthogonal quaternary veins; adaxial surface with indumentum initially densely globular-stellate, but quickly glabrescent, the midvein and major secondary veins slightly impressed, other veins ± flat; abaxial surface with sparse to moderate, globular-stellate to elongate short-branched hairs to 0.1–0.25 mm across and with minute globular hairs on the midvein and major secondary veins, the hairs ± persistent, the epidermis clearly visible, the midvein and major secondary veins prominently raised, minor secondary, tertiary, and quaternary veins raised, other veins slightly raised to flat. *Inflorescences* terminal, open-paniculate cymes of 4 or 5 major branch

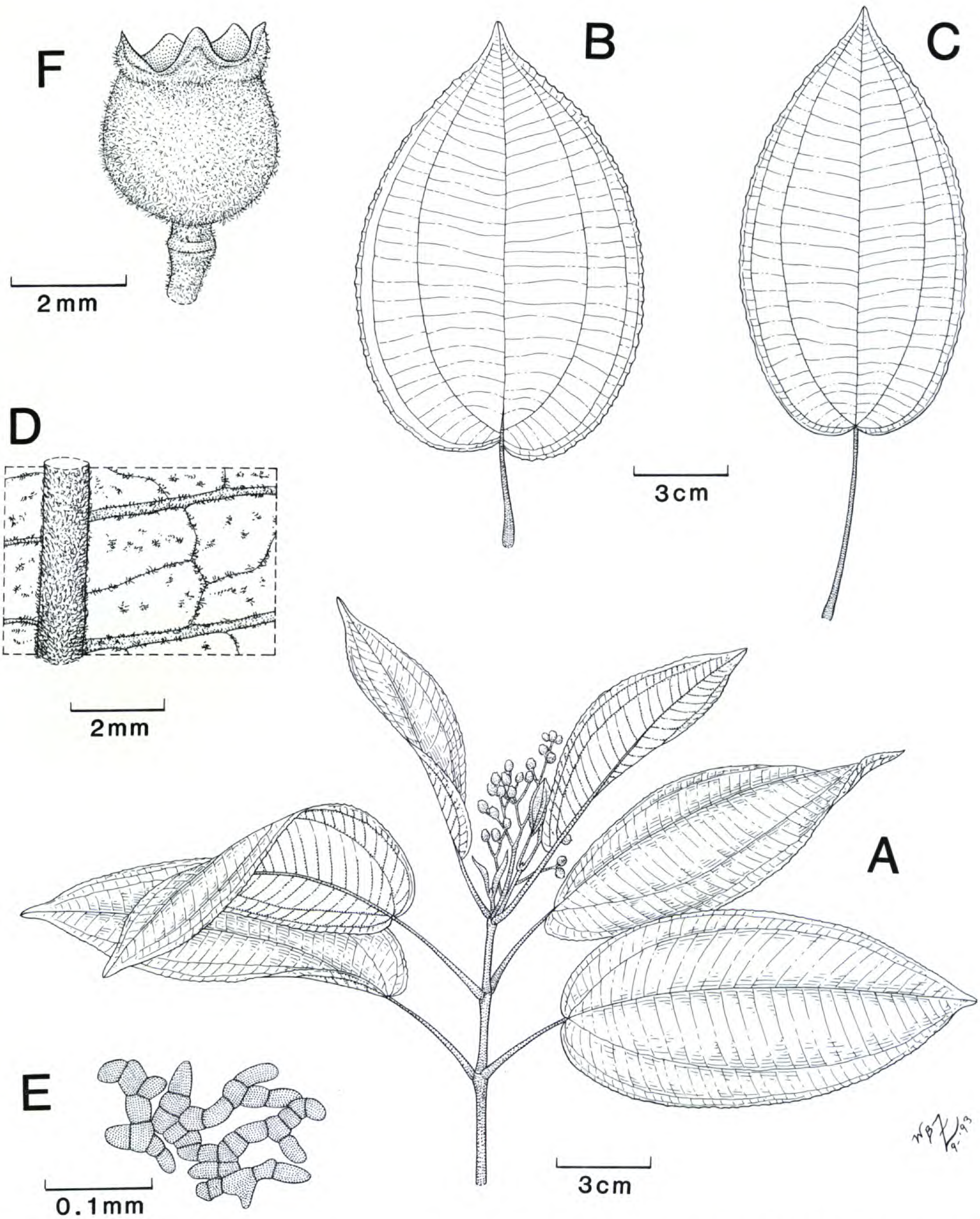

Figure 1. *Miconia alainii* Judd & Skean. —A. Habit. —B, C. Leaves. —D. Detail of abaxial leaf surface. —E. Hair from abaxial leaf surface. —F. Fruit. (A, C, F, from *Liogier 25179;* B, D, E, from *Judd 6569.*)

pairs, ca. 6.5 cm long, 4 cm across; proximal segment of lowermost branches 1–1.2 cm long, distal internodes shorter, ultimate branchlets 1–9 mm long; peduncle ca. 1.7 cm long; each branch associated with an early caducous, ovate bract, ca. 1.5–4 × 0.5–1 mm, the apex acute; flowers in dichasia, each subtended by 2 caducous bracteoles. *Flowers* 5-merous, with pedicel 0–1 mm long. *Hypanthium* cylindrical, free portion ca. 0.6–0.8 mm long, the outer surface with sparse to moderate, globular-stellate hairs and a few minute globular hairs, the inner surface glabrous and obscurely 10-ridged, the

apices of the ridges slightly projecting. *External calyx teeth* (= lobes) 0.7–0.9 × 1.5–1.7 mm, ± triangular, the apex acute; *internal calyx lobes* 0.5–0.7 × 1.5–1.7 mm, broadly triangular, the apex acute to rounded, the margin entire; calyx tube 0.3–0.4 mm. *Petals* and *stamens* not seen. *Ovary* 3-loculate (N = 3), ⅔-inferior, globose to ovoid, 2.8 × 2.4 mm, glabrous and ridged, with fluted apical projection to 0.5 mm encircling base of style. *Berries* (± immature) globose, 3.5 × 3.5 mm, green with red tinge. *Seeds* angular-obovoid, 0.7–1 mm long; testa smooth.

Distribution and ecology. *Miconia alainii* is endemic to Hispaniola and known only from the type locality, the easternmost peak of the Sierra de Baoruco. This location is usually referred to as "Monteada Nueva" in reference to a nearby coffee finca, but this forested region actually occupies the summit of Loma Trocha de Pey, at ca. 18°07.5N, 71°13.5W (T. Zanoni, pers. comm.). This peak is separated from the remaining part of the mountain range by a slight depression, the Hoyo del Pelembito, and thus its high-elevation forests are fairly isolated from those farther to the west in the Sierra de Baoruco. *Miconia alainii* is an occasional understory shrub in the diverse, broad-leaved cloud forests at ca. 1,300–1,400 m (near the summit). Associated melastomes include: *Calycogonium* sp., *Clidemia umbellata* (Miller) L. O. Williams, *Henriettea barkeri* (Urban & Ekman) Alain, *Leandra lima* (Desrousseaux) Judd & Skean, *L. limoides* (Urban) Judd & Skean, *Mecranium ovatum* Cogniaux, *Meriania involucrata* (Desrousseaux) Naudin, *Miconia dodecandra* (Desrousseaux) Cogniaux, *M.* cf. *campanensis* Urban & Ekman, *M. subcompressa* Urban, *M. tetrastoma* Naudin, and *Ossaea* [*Sagraea*] *gracilis* Alain.

Etymology. It is a pleasure to name this species after Henri Alain Liogier (b. 1916), who has collected extensively throughout the Dominican Republic, Cuba, and Puerto Rico.

Miconia alainii is readily distinguished from all other members of *Miconia* sect. *Chaenopleura* (or of other sections) occurring in the Greater Antilles. It is somewhat similar to *M. adenocalyx* Urban & Ekman due to its cordate-based leaves with a sparse to moderate indumentum of minute ± irregularly stellate-branched hairs on the veins of the abaxial surface. It is readily distinguished from that species by the much larger leaves, i.e., 8.5–16 × 5.2–10.5 cm versus 2.8–14 × 1.4–5.6 cm, with the innermost pair of secondary veins placed further in from the margin, i.e., 10–23 mm versus 2.5–9 mm; the lack of long-stalked gland-headed hairs on the inflorescence axes, hypanthium, and calyx; the thinner walled and more irregularly branched hairs that are more closely appressed to the abaxial leaf surface; and the inflorescences with shorter ultimate branches, i.e., 1–9 mm versus 2–15 mm long. The peduncle is also shorter in *M. alainii*, but additional collections are needed to confirm the usefulness of this character, as well as that of ultimate branch length. *Miconia alainii* is also similar to *M. favosa* (Desrousseaux) Naudin, one element in a species complex characterized by large, cordate-based, and ± bullate leaves with ± dendritic hairs. Both species are characterized by large cordate-based leaves with a ± moderate covering of branched hairs along the veins; both also have broadly rounded cymes. However, the hairs of *M. alainii* are very small and irregularly stellate-branched to globular-stellate, whereas those of *M. favosa* (and presumed relatives such as *M. xenotricha* Urban & Ekman and *M. campanensis*) are larger and ± dendritic. In addition, *M. favosa* has a pair of conspicuous flanges below the point of petiole attachment at each node; no such flanges occur in *M. alainii*. The tertiary veins in leaves of *M. favosa* are strongly impressed above, while those of *M. alainii* are ± flat.

Miconia adenocalyx is restricted to the Massif du Nord/Cordillera Central and thus is isolated geographically from *M. alainii*. *Miconia favosa* has been collected in the Sierra de Neiba and Massif de la Selle (including the adjacent, western portion of the Sierra de Baoruco). This species has not been collected east of the Hoyo del Pelembito; thus *M. favosa* and *M. alainii* appear to be allopatric.

Plants frequently identified as *Miconia favosa* also have been collected at Monteada Nueva. These plants, however, differ from typical *M. favosa* in their lack of nodal flanges, slightly more narrowly ovate leaves with long-stalked multicellular hairs (each with an expanded, thickened base) on the adaxial epidermis, branched-dendritic hairs with longer stalks on the abaxial epidermis, and more elongate inflorescences. The identity of these plants is currently under investigation, but they are tentatively considered to represent a disjunct population of *M. campanensis* (a species previously known from the Sierra de Neiba and Cordillera Central). *Miconia* cf. *campanensis* occurs with *M. alainii*; these plants are very easily distinguished from this species, however, by the features noted above, especially their strongly bullate leaves with thick-based long-stalked multicellular hairs.

The discovery of *Miconia alainii* brings the number of species of *Miconia* reported from Hispaniola to 70 (see Moscoso, 1943; Judd & Skean, 1987; Judd et al., 1988; Judd & Beaman, 1988, Judd &

Skean, submitted). However, when probable synonyms are taken into account, a more realistic estimate is about 55 (Judd, in prep.).

Paratypes. DOMINICAN REPUBLIC. **Prov. Barahona:** Sierra de Baoruco, Loma Trocha de Pey or "Monteada Nueva," above (E of) Polo, 1,325–1,400 m, 18 May 1992 (veg.), *Judd 6569* (F, FLAS, JBSD, MO, NY, US).

Acknowledgments. We thank Thomas A. Zanoni and the staff of the Jardín Botánico Nacional in Santo Domingo for logistical support while conducting fieldwork in the Dominican Republic. We are grateful to Timothy McDowell for his assistance in the field and to Wendy Zomlefer for her excellent illustration. This research was supported by NSF Grant BSR-9016793.

Literature Cited

Cogniaux, A. 1891. Melastomaceae. *In:* A. & C. de Candolle, Monographiae Phanerogamarum 7. Masson, Paris.

Judd, W. S. & R. S. Beaman. 1988. Taxonomic studies in the Miconieae (Melastomataceae). II. Systematics of the *Miconia subcompressa* complex of Hispaniola, including the description of two new species. Brittonia 40: 368–391.

——— & J. D. Skean, Jr. 1987. Three new angiosperms from Parc National Pic Macaya, Massif de la Hotte, Haiti. Bull. Florida State Mus., Biol. Sci. 32(1): 137–150.

——— & ———. 1991. Taxonomic studies in the Miconieae (Melastomataceae). IV. Generic realignments among terminal-flowered taxa. Bull. Florida Mus. Nat. Hist., Biol. Sci. 36(2): 25–84.

———, ——— & R. S. Beaman. 1988. *Miconia zanonii* (Melastomataceae: Miconieae), a new species from Hispaniola. Brittonia 40: 208–213.

Moscoco, R. M. 1943. Catalogus Florae Domingensis, Parte I. Spermatophyta. Univ. de Santo Domingo, L. S. Printing, New York, New York.

A Hyperparasite Mistaken for an Inflorescence: The Identity and Typification of *Phoradendron rusbyi* Britton (Viscaceae)

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ABSTRACT. The type of *Phoradendron rusbyi* Britton (Viscaceae) consists of two species of *Phoradendron*, one hyperparasitic on the other. The hyperparasite is designated to be the type; the host mistletoe is *P. crassifolium* (DC.) Eichler.

The protologue of the Bolivian *Phoradendron rusbyi* Britton (in Rusby, 1900; not to be confused with *P. rusbyanum* Trelease) has been puzzling in the past in that it seemed to be made up of discordant elements. Britton described leaf shape, while the rather fragmentary types at NY are strictly squamate. The species is exceedingly rare, being known only from the type collection. Inspection of the types at NY and US, however, has provided a solution to the problem.

It turns out that, unwittingly, Britton was dealing with one species of mistletoe hyperparasitic on another, a situation elsewhere known both in *Phoradendron* and the closely related *Dendrophthora*. Thus, part of his protologue describes the leaves of the host mistletoe, the well known *Phoradendron crassifolium* (DC.) Eichler, and part of it (the "inflorescence") applies to the hyperparasite. We thus have what Article 7B.5 of the International Code of Botanical Nomenclature (Greuter et al., 1988) calls "two or more heterogeneous elements" being fused into a single protologue. This situation requires, among other things, a decision on typification. The Code (Art. 9.2), in such cases, prescribes that the proposed name "must remain attached to that part (lectotype) which corresponds most nearly with the original." In the particular case at hand, however, it is debatable whether the features belonging to one or the other species predominate in the original description. Also, since the application of Britton's name to the older *P. crassifolium* would then necessitate a new name for the hyperparasite, that course of action would be unfortunate. I therefore here designate Britton's name to apply to the squamate hyperparasite, not to the host mistletoe. In order to clarify the situation, I add an illustration (Fig. 1) of the reconstructed US lectotype as well as a brief new diagnosis of *P. rusbyi*.

Phoradendron rusbyi Britton, Bull. Torrey Bot. Club 27: 136. 1900. TYPE: Bolivia. Mapiri, 5,000 ft., Apr. 1886, *Rusby 1543* (lectotype, designated here, US; isolectotypes, NY (2)).

Small, squamate species, internodes to 4 cm long, extremely compressed, to 1.3 cm wide, cuneate in shape, in alternating planes from internode to internode. Lateral branches without basal cataphylls, the first leaf scales in median position. Probably monoecious, the male flowers fewer than the female and higher on fertile internodes (?). Inflorescences both lateral (where apparently solitary) and terminal, at least 4 cm long, peduncle 3–5 mm, stout, simple, followed by at least 4 fertile internodes, flowers to ca. 15 per fertile bract, triseriate, the fertile internodes stout but not clavate. Fruit globular, ca. 2.5 mm diam., petals closed.

Britton placed his new species in *Phoradendron*, but in the monograph of this genus by Trelease it is referred to *Dendrophthora* without discussion (Trelease, 1916: 218). It is almost certain that Trelease did not study the crucial anther morphology, as I know of no reference to this, the most important generic distinction, in any of his publications. It may well be that he was guided in his placement by the fact that lateral branches of *P. rusbyi* lack any basal cataphylls. The primary division of *Phoradendron* in Trelease's treatment was according to whether basal cataphylls were or were not present, the acataphyllous "Boreales" supposedly not occurring further south than southern Mexico. In point of fact, a number of exceptions to this simple dichotomy of the genus are now known (unpublished information). More relevant to the present species is the fact that the absence of cataphylls by itself cannot reliably be used for generic placement. Unfortunately, I have not been able to find mature male flowers.

Notwithstanding the absence of basal cataphylls, I feel that the likelihood of the species being a *Phoradendron* outweighs the other option. The extreme reduction of the plant may well mean that its hyperparasitism is obligatory. There is a group of

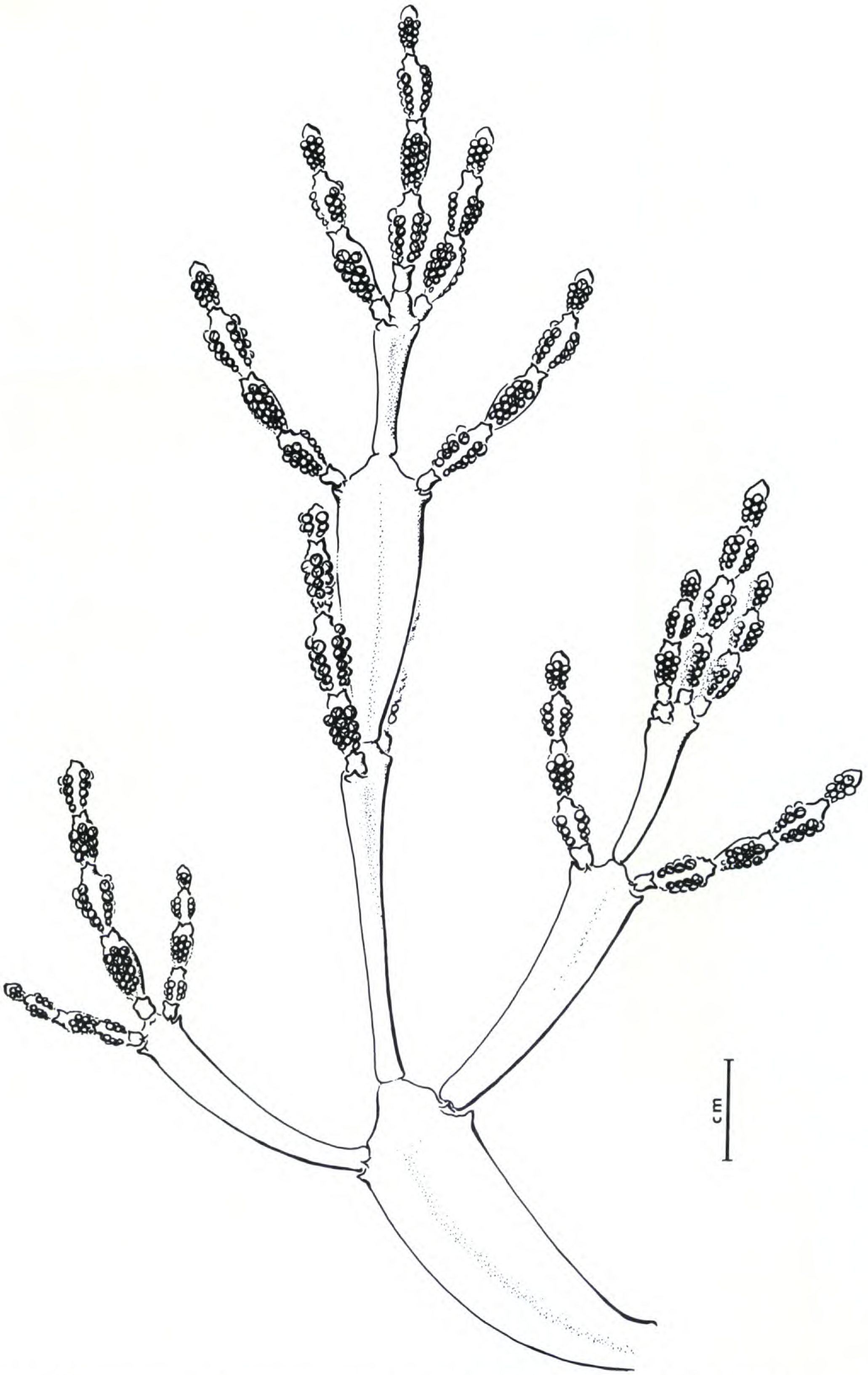

Figure 1. Reconstruction of *Phoradendron rusbyi* Britton from the lectotype at US. Scale bar = 1 cm.

largely or exclusively hyperparasitic species of *Phoradendron* in Central and South America with a strong tendency to leaf reduction and flattened or winged internodes. The common, leafy *P. dipterum* Eichler is a well known member of this group; aphyllous species are *P. iltisiorum* Kuijt and *P. aequatoris* Urban, while *P. fasciculatum* Kuijt is nearly leafless. These species are also characterized by the emergence of several shoots from a haustorial cushion connecting the two mistletoes (see Kuijt, 1987, fig. 6). One of the two NY types clearly has such a cushion and emergence pattern. Even more interesting is the fact that at least one species of this complex, *P. calyculatum* Trelease, has lost its basal cataphylls, and that because of this, the species has traditionally been misplaced in "Boreales." My assumption is, therefore, that *P. rusbyi* is yet another acataphyllous member of this group of hyperparasites. No hyperparasitism is known to occur in continental *Dendrophthora*. However, a rare Cuban endemic, *D. epiviscum* (Grisebach) Eichler, parasitizes other species of *Dendrophthora* or *Phoradendron* (Kuijt, 1961). The two species, even in the absence of male flowers, may be easily distinguished by the tetrapterous stems and fewer fertile internodes with no more than seven flowers per bract in *D. epiviscum*.

Literature Cited

Greuter, W., H. M. Burdet, W. G. Chaloner, V. Demoulin, R. Grolle, D. L. Hawksworth, D. H. Nicholson, P. C. Silva, F. A. Stafleu, E. G. Voss & J. McNeill. 1988. International Code of Botanical Nomenclature. Regnum Veg. 118.

Kuijt, J. 1961. A revision of *Dendrophthora*. Wentia 6: 1–145.

———. 1987. Novelties in Mesoamerican mistletoes (Loranthaceae and Viscaceae). Ann. Missouri Bot. Gard. 74: 511–532.

Rusby, H. H. 1900. An enumeration of the plants collected by Dr. H. H. Rusby in South America, 1885–1886, xxx. Bull. Torrey Bot. Club 27: (see p. 136–137).

Trelease, W. 1916. The Genus *Phoradendron*. Univ. Illinois Press, Urbana, Illinois.

New Species in Mexican and Mesoamerican Rubiaceae

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ABSTRACT. Ten new species of Rubiaceae from southern Mexico and Mesoamerica are described and illustrated: *Bouvardia macdougallii* Lorence, *Hoffmannia ixtlanensis* Lorence, *H. minuticarpa* Dwyer & Lorence, *Machaonia martinezorum* Lorence, *Psychotria breedlovei* Lorence, *P. thornei* Lorence, *Rondeletia breedlovei* Lorence, *R. chiriquiana* Lorence, *R. megalantha* Lorence, and *Sommera parva* Lorence.

During the course of preparing a treatment of the Rubiaceae for *Flora Mesoamericana*, collections representing a number of undescribed species from southern Mexico and Mesoamerica were encountered. Many of these collections are the result of recent fieldwork in botanically poorly known or under-collected areas in conjunction with the *Flora of Chiapas*, *Flora de Oaxaca*, and *Flora Mesoamericana* projects. Ten new species are described and illustrated herein, and their affinities are discussed. Most of these taxa occur within the region covered by the *Flora Mesoamericana* project, i.e., southern Mexico from the Isthmus of Tehuantepec to the Panama–Colombia border (Anon., 1982). A complete account of the Mesoamerican Rubiaceae will be given in a forthcoming treatment for *Flora Mesoamericana* (Dwyer & Lorence, in prep.).

Bouvardia macdougallii Lorence, sp. nov. TYPE: Mexico. Oaxaca: Cerro Atravesada–Cerro Azul, "Arroyo Rana," shrub–small tree, flowers white, Dec. 1956 (fl, fr), *T. MacDougall s.n.* (holotype, MEXU; photo, PTBG). Figure 1.

Species *Bouvardiae dictyoneurae* Standley affinis, sed stipulis brevioribus 2.5–3.5 mm longis, aristis brevioribus nec filiformibus nec glandulosis, corolla alba breviore 8–10 mm longa, corollae tubo 4–5 mm longo et lobis 4–5 mm longis intus dense villosis differt.

Shrub or small tree, the twigs glabrous, 1.5–2 mm diam., the internodes 3.6–5 cm long. Leaves opposite, glabrous, subsessile; petioles 1–1.5 mm long, 0.7–0.9 mm diam.; lamina ovate, 3–5.8 × 1.4–2.6 cm, slightly discolorous, stiffly chartaceous, rugose-reticulate, the base obtuse, rounded or subtruncate, the apex acuminate, the acumen 5–15 mm long, occasionally falcate, the 2° veins 3–5 pairs, pinnate, camptodromous, arcuate, the 3° veins numerous, oblique, reticulate, the venation raised and visible to 3° on both surfaces, the margin callose; stipules persistent, acutely to obtusely triangular or subtruncate, 2.5–3.5 × 2–3 mm, externally with a row of septate hairs 0.2–0.4 mm long, glabrate, internally glabrous, the apex acuminate, 1–1.5 mm long, the margin entire or with 1–3 pairs of digitate processes 0.3–0.5 mm long. Inflorescence cymose-corymbose, terminal, sessile at the twig apex, 1.5–4.5 × 2–5 cm, glabrous, 9–18-flowered, the 1° branches 3–5, 7–20 mm long, subtended by reduced leaves, the 2° axes and pedicels bracteolate; flowers 4-merous, on pedicels 4–7 × 0.2 mm, the hypanthium subglobose-depressed, glabrous, 1 mm long, 1.2–1.5 mm wide, the calyx cup 0.2–0.3 mm deep, the calyx lobes equal, erect, lanceolate or subulate, 2.5–3 × 0.7–1 mm, glabrous; corolla white, at anthesis funnelform, 8–10 mm long, externally glabrous, internally densely villous on the lobes, the tube with scattered hairs internally, the hairs whitish, septate, to 0.5 mm long, the tube 4–5 mm long, 3–4 mm wide distally, the lobes 4–5 × 1.5–2.5 mm, acute, spreading 45–90°; short-styled flowers with stamens exserted, the anthers linear-ellipsoid, 2 mm long, the filaments 1.5–2 mm long, attached just below apex of tube; style 1.3–1.5 mm long, the two papillose stigmas 1.3–1.5 mm long, the disc 0.3 mm high; long-styled flowers not seen. Submature capsules oblate, 3.5 × 4.5 mm, glabrous, ⅔–¾ inferior; submature seeds subcircular to ellipsoid, 1–1.5 mm long, the margin winged, 0.3–0.5 mm wide.

Distribution. Known only from the type locality in the Sierra Atravesada of southeastern Oaxaca, Mexico. The isolated Sierra Atravesada is situated north of the town of Niltepec and constitutes the disjunct northwestern part of the Sierra Madre de Chiapas. Arroyo Rana lies between Cerro Azul (2,300 m) and Cerro Atravesada (1,600 m). Geologically the area is composed of limestone and coarse-grained sandstone (MacDougall, 1971) and is home to other endemics such as *Rondeletia atravesadensis* Lorence and *R. macdougallii* Lorence (Lorence, 1991).

Habitat. Montane evergreen cloud and elfin forest, ca. 1,600–2,300 m elevation. Flowering and fruiting in December.

Figure 1. *Bouvardia macdougallii* Lorence. Photos of holotype, *T. MacDougall* in December 1956 (MEXU), with dissected corolla and fruiting hypanthium.

Bouvardia macdougallii is characterized by opposite leaves, pleiochasial inflorescences, and short corollas, placing it in subgenus *Bouvardiastrum* Schlechtendal (Blackwell, 1968). Although the circular, winged seeds are characteristic of *Bouvardia*, the extremely short corolla tube equalling the lobes in length, internally densely villous corolla lobes, and larger habit set *B. macdougallii* apart from all other members of the genus. Vegetative and capsular morphology place it closest to *B. dictyoneura* from Chiapas and Guatemala, which is distinguished by longer red or orange-red corollas with the tube greatly exceeding the lobes and a villous ring internally near the base of the tube, and stipules with long, filiform processes always terminated by glands.

This new species is named for the late Thomas B. MacDougall, an intrepid naturalist and botanical explorer who spent each winter in the Isthmus of Tehuantepec, Oaxaca (Stix, 1975). While exploring some of the most remote and biologically interesting regions of Oaxaca and Chiapas, "Don Thomas" collected numerous botanical and zoological specimens for various museums and botanical gardens. The two principal sets of MacDougall's botanical collections, mostly unicates, are deposited at MEXU and NY, with some duplicates at CAS and US.

Hoffmannia ixtlanensis Lorence, sp. nov. TYPE: Mexico. Oaxaca: Distrito de Ixtlán, Sierra de Juárez, ruta 175 Tuxtepec a Oaxaca, ca. 5 km al N de Vista Hermosa, 1,260 m, *D. H. Lorence, R. Torres C. & R. Cedillo T. 4013* (holotype, MEXU; isotypes, MO, PTBG). Figure 2a, b.

Species *Hoffmanniae minuticarpae* Dwyer affinis, sed caulibus foliisque sparsim puberulis vel glabratis, inflorescentiis floribusque fere glabris, fructibus majoribus 4–5 mm diametro differt.

Shrubs 1–5 m tall, the stems erect, 3–4 cm diam., the new growth sparsely and finely hirtellous, the leafy stems 3–5 mm diam., drying brownish black, glabrous, slightly compressed, the internodes 1–8 cm long. Leaves opposite, petiolate, those of a pair at a node subequal to unequal, one up to 50% larger than the other; petioles 2–5 cm long, 1–1.5 mm diam., canaliculate, glabrous, winged in distal half; lamina obovate, obovate-elliptic or elliptic, 11–25

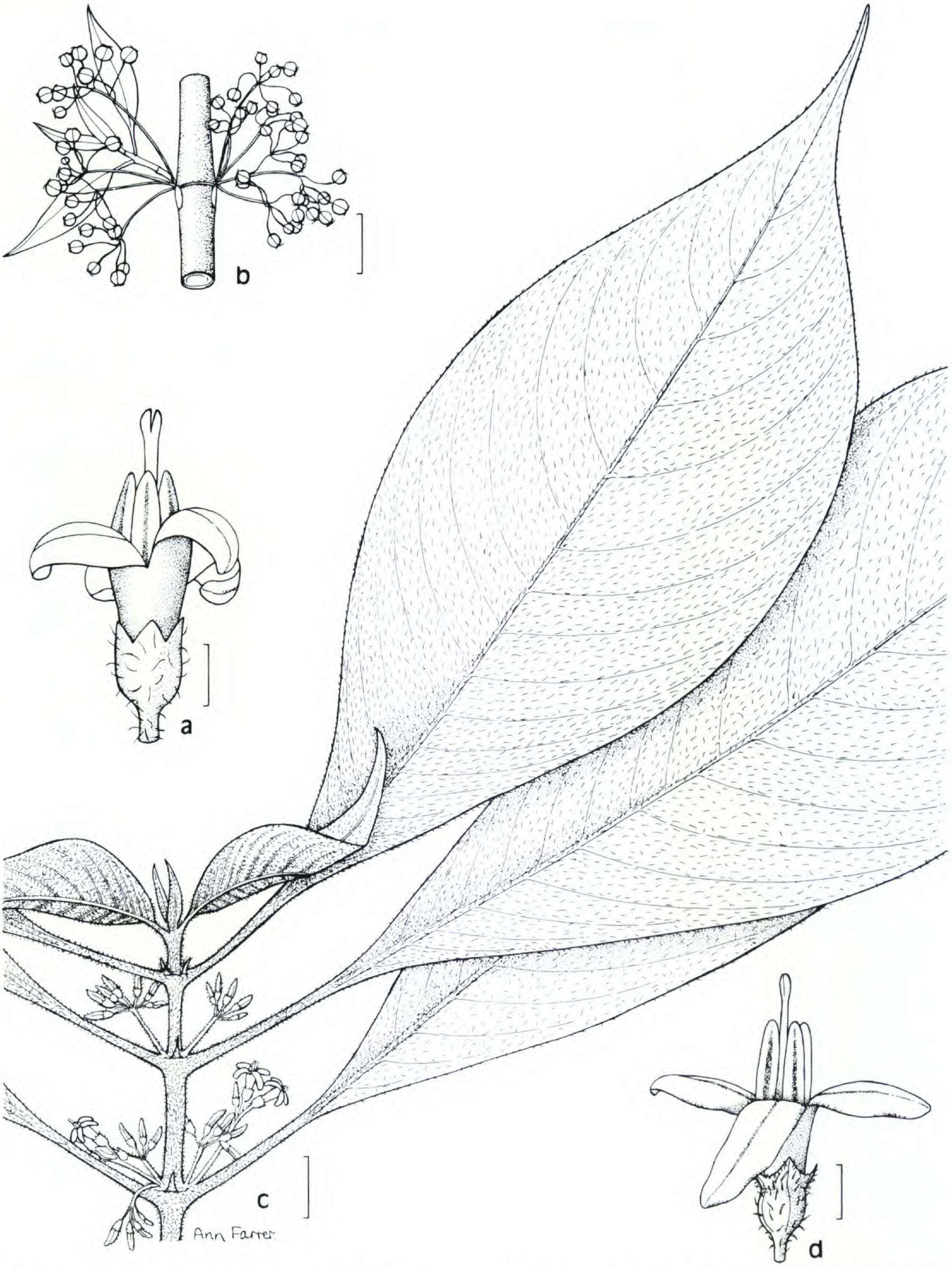

Figure 2. Two species of *Hoffmannia*. a, b. *H. ixtlanensis* Lorence. —a. Detail of flower. —b. Infructescences. c, d. *H. minuticarpa* Dwyer & Lorence. —c. Habit. —d. Detail of flower. a, b, *Lorence 4720* (PTBG); c, d, *Sinaca C. 531* (PTBG). Bars = 1 mm in a, d, and 1 cm in b, c.

× 4–8 cm, often falcate, membranaceous, drying green, discolorous, adaxially hirtellous, abaxially hirtellous, especially along veins and costa, the base narrowly cuneate, attenuate and decurrent, the apex acuminate to caudate, the acumen 1–2 cm long, the 2° veins 11–15 pairs, arcuate, acrodromous, the prominent 3° veins oblique, the venation visible to 5° on both surfaces; stipules triangular, acute from a broad base, 1.5–3 × 2–4 mm, deciduous, externally glabrous or sparsely hirtellous, the inner surface and margins with numerous short brown colleters. Inflorescences axillary and on leafless nodes, solitary or usually in groups of 2–6, shorter than petioles, 1–1.5 cm long, monochasial-cymose, unbranched, often umbelliform, 6–12-flowered, glabrous, the peduncle 5–10 × 0.3–0.5 mm; flowers on pedicels 1–2 × 0.2–0.3 mm, these minutely bracteolate basally, the hypanthium turbinate to subglobose, 1–1.2 × 0.8–1 mm, slightly compressed and bisulcate, venose, glabrous, the calyx cup 0.1–0.2 mm deep, the calyx lobes 4, acutely triangular, 0.3–1 × 0.3–0.6 mm, the margins minutely hirtellous-ciliolate; corolla in bud 4–5 mm long, glabrous externally and internally, pale yellow or white when fresh, at anthesis funnelform, the tube 2.5–3 × 1 mm, the lobes 4, narrowly elliptic to narrowly ovate, 3 × 1–1.5 mm, spreading 45°, the stamens affixed 1 mm below apex of tube, the filaments 1 mm long, the anthers exserted, linear-ellipsoid, 3 × 0.5 mm, acute at apex, bilobed at base, the style 3–4 mm long, the entire, papillose stigma 2 mm long. Ripe fruits reddish pink, globose, 4–5 mm diam.; seeds angulate, 0.2–0.3 mm diam., the testa light brown, reticulate.

Distribution. Oaxaca, Mexico, known only from the Sierra Madre de Oaxaca, on the northern slopes of the Sierra de Juárez in the District of Ixtlán and from near Santa María Choapan in the the District of Choapan.

Habitat. Montane cloud forest (bosque mesófilo de montaña) with *Liquidambar*, *Engelhardtia*, *Alfaroa*, *Hedyosmum*, *Brunellia*, and Lauraceae, and disturbed or secondary forest with coffee plantings, 750–1,600 m elevation. This new species is abundant locally as an understory shrub. Flowering in February, April, June, and August and fruiting in February, June, July, August, and October.

Hoffmannia ixtlanensis is most closely allied to *H. minuticarpa* Dwyer & Lorence (described below) from the Sierra de Los Tuxtlas region of southern Veracruz. The latter species differs in its denser and persistent villosulous pubescence of crinkled pale brown hairs on the young stems, leaves, and inflorescence (Fig. 2c, d).

Paratypes. MEXICO. **Oaxaca:** Distrito de Ixtlán, Sierra de Juárez, Ruta 175 Tuxtepec a Oaxaca, 4 km al NE de La Esperanza, 1,500 m, *Lorence & Cedillo T. 4186* (MEXU, MO); 31 km S de Valle Nacional, camino a Oaxaca, *Martínez S. et al. 8730* (MEXU); 5 km al N de Vista Hermosa, 1,175 m, *Torres C. & Cedillo T. 1459* (MEXU, MO), *Cedillo T. & Torres 1595* (MEXU, MO), *Lorence et al. 4720* (MEXU, MO, PTBG); 1.5–2 mi. N of Vista Hermosa, 4,500 ft., *Webster et al. 17469* (DAV); 39 km al S de Valle Nacional, 1,600 m, *Rzedowski 34062* (ENCB, MEXU, MO); 14 mi. above (W) of Valle Nacional, 1,210 m, *Croat 39779* (MO); 14.9 mi. S of bridge at Valle Nacional, 1,400 m, *Croat 48001* (MO); 18.4 mi. S of bridge at Valle Nacional, 1,500 m, *Croat 48076* (MO); 17–19 mi. above bridge at Valle Nacional, 17°37′N, 96°21′W, 1,450 m, *Croat & Hannon 65558* (MO); ruta 175 Tuxtepec a Oaxaca, ca. 7 km al S de San Mateo Yetla, *Cedillo T. et al. 1655* (MEXU, MO, PTBG); Puerto Eligio, km 151 carretera Tuxtepec–Oaxaca, 750 m, *Martínez C. 734* (MEXU), *Torres C. 531* (MEXU, PTBG); Distrito de Choapan (as "Choapam"), Santa María, Montaña Santa María, 1,500 m, *Mexia 9268* (UC).

Hoffmannia minuticarpa Dwyer & Lorence, sp. nov. TYPE: Mexico. Veracruz: Municipio de Soteapan, Cumbres de Bastonal, a 11 km al S de Tebanca, 1,100 m, 26 abr. 1982, *R. Cedillo T., D. Lorence & G. Ibarra M. 1280* (holotype, MEXU; isotype, MO). Figure 2c, d.

Species *Hoffmanniae ixtlanensi* Lorence affinis, sed pubescentia densiore hirtello-villosa ex trichomatibus septatis crispis constanti, fructibus minoribus 2 mm diametro differt.

Shrubs 1.5–5 m tall, the new growth villosulous with pale brown crinkled septate trichomes 0.3–0.5 mm long, the leafy stems 3–3.5 mm diam., brown, villosulous, compressed, the internodes 2–4 cm long. Leaves opposite, petiolate, those of a pair at a node subequal; petioles villosulous, 3–5 cm × 1.4–1.5 mm; lamina elliptic or lanceolate-elliptic, 11.5–25 × 4–8 cm, membranaceous, drying light green, slightly discolorous, both surfaces hirtellous with crinkled hairs, these much denser and white abaxially along the costa and veins, numerous raphides visible, the base narrowly cuneate, attenuate and often decurrent along petiole, the apex acuminate to caudate, the acumen 1–2 cm long, the 2° veins 10–18 pairs, departing straight then arching distally, acrodromous, the 3° veins oblique, the venation prominent and visible to 4° on both surfaces; stipules thick, appressed, triangular, 1.5–2 × 2 mm, the apex acute or acuminate, brown, externally villosulous, eventually deciduous. Inflorescences axillary and on leafless nodes, solitary or in groups of 2–3, shorter than the petioles, 1.5–2 cm long, monochasial, scorpioid or umbelliform, 7–9-flowered, the axes light brown-villosulous, the peduncle 5–12 ×

0.3–0.4 mm; flowers on pedicels 1.5–3 × 0.2–0.3 mm, each with a minute triangular bracteole basally, the hypanthium subglobose, 1.2–1.5 × 1.1–1.3 mm, slightly compressed and bisulcate, hirtellous, the calyx cup 0.2–0.4 mm deep, the calyx lobes 4, narrowly to broadly triangular, 0.3–0.5 × 0.3–0.6 mm, hirtellous, the margins ciliolate; corolla in bud 4 mm long, externally hirtellous on lobes, internally glabrous, greenish yellow when fresh, at anthesis funnelform, the tube 1.5 mm long, 0.9–1 mm diam., the lobes 4, 3–3.5 × 1–1.3 mm, narrowly ovate-elliptic, recurving, the stamens affixed 0.5 mm below apex of tube, the filaments 0.5 mm long, the anthers exserted, linear-ellipsoid, 2 × 0.5 mm, apically acute, basally bilobed; style 5–5.5 mm long, the papillose stigma 0.5–0.7 mm long. Fruits globose, 2 mm diam. (unripe), seeds not seen.

Distribution. Known only from the Sierra de Los Tuxtlas region of southeastern Veracruz, an isolated volcanic mountain range of Pleistocene origin.

Habitat. Lowland and lower montane tropical rainforest (selva alta perennifolia), 600–1,200 m elevation. Flowering and young fruit in April, fruiting in July.

Hoffmannia minuticarpa is recognized by its large membranaceous leaves with white appressed hairs, villosulous new growth with pale brown crinkled septate hairs, sparsely villosulous corolla lobes, and small globose fruits. It is most closely allied to *H. ixtlanensis*, which differs by its much sparser and finer pubescence on the new growth (soon glabrescent), and nearly glabrous inflorescence and flowers (Fig. 2a, b). John D. Dwyer, coauthor of this species, is currently revising *Hoffmannia*.

Paratypes. MEXICO. **Veracruz:** Municipio de San Andrés Tuxtlas, Estación de Biología Tropical Los Tuxtlas, 18°34′–36′N, 95°04′–09′W, 600 m, lote 71, *Sinaca C. et al. 531* (MEXU, PTBG), *Ibarra M. 2983* (MEXU), *Ibarra M. 3119* (MEXU); Mpio. de Catemaco, en Tebanca, rumbo a las cumbres de Santa Marta, *Soto E. s.n.* (MEXU, MO).

Machaonia martinezorum Lorence, sp. nov. TYPE: Mexico. Chiapas: Municipio de Ocosingo, a 50 km al S de boca Lacantum, 130 m, 24 June 1986, *E. Martínez S. 19016* (holotype, PTBG; isotypes, MEXU, PTBG). Figure 3.

Species *Machaoniae martinicensi* (DC.) Standley affinis, sed habitu saepe scandenti, foliis hirtellis nervis secundariis paucioribus (paribus 4–5) munitis, lobis calycinis 4, tubo corollino 2.5–3 mm longo intus sparse villoso, et fructu plerumque glabro incrassationibus suberosis maximam partem tecto differt.

Woody vine or shrub, the stems spiny, the leafy twigs 1.5–2 mm diam., densely hirtellous-villosulous with antrorsely curved septate hairs, the internodes (0.5–)2–7 cm long, the older branches 5–6 mm diam., becoming lenticellate, often armed with slender axillary spines 5–12(–25) mm long. Leaves opposite, those of a pair equal, petiolate; petioles 2–7 × 0.3–0.6 mm, densely hirtellous-villosulous; lamina ovate, 1.3–7.2 × 0.7–3.3 cm, chartaceous, adaxially sparsely hirtellous with curved acicular hairs, abaxially hirtellous, the hairs denser along costa and 2° veins, often barbate in axils, the base acute to obtuse or rounded, the sides often attenuate, the apex acute to shortly acuminate, the acumen 2–8 mm long, the 2° veins 4–5(–6) pairs, arching and evanescent toward margin, the venation visible to 2°–3° adaxially, finely reticulate and visible to 4° abaxially, the margin ciliolate; stipules black, the body obtuse or triangular, 1–1.5 × 1.5–3 mm, prolonged into a slender awn 2–3 mm long, externally hirtellous, the margins with 2–4 black digitate colleters. Inflorescences terminal, also often terminal on short axillary branchlets, cymose-corymbose, rounded, 2.5–5 × 2–7 cm, usually sessile and subtended by a pair of leaves or the peduncle 1.7–4 cm × 0.5–1 mm, hirtellous on opposite sides, the 1° branches 3, (0.4–)1–4 cm long, these branching 3–4 times, the branches subtended by linear or lanceolate bracteoles 2–4 mm long, the axes adaxially hirtellous, the ultimate branches bearing cymules of 2–3 flowers. Flowers 4-merous, distylous, sessile or on slender pedicels 1–2 mm long, the hypanthium turbinate, 0.8–1.2 × 0.6–1 mm, compressed, glabrous or sparsely hirtellous, with 6–8 ribs, the calyx cup 0.2 mm deep, the calyx lobes ovate or triangular, 0.8–1 × 0.5–0.8 mm, the margin ciliolate; corolla white when fresh, funnelform, the tube 2.5–3 × 1.5–2 mm at apex, externally glabrous, internally sparsely villous, the lobes ovate-elliptic, obtuse, 1–2 × 1–1.5 mm, both surfaces minutely papillose-puberulent; stamens exserted, the filaments attached in throat, 0.5–1.5 mm long, the anthers ellipsoid, 0.6–0.7 mm long; style glabrous, 2–3 mm long, the stigma lobes 2, ellipsoid, 0.5 mm long; disc bilobed, 0.4 mm diam. Fruits obovoid-ellipsoid, 4 × 2 mm, truncate at base and apex, slightly wider distally, strongly compressed, bisulcate, each mericarp with tan corky thickenings developing from the costae and covering most of the surface, leaving 2 dark brown ellipsoid medial grooves.

Distribution. Known from western Chiapas and northern Oaxaca in Mexico, and the Petén region of Guatemala.

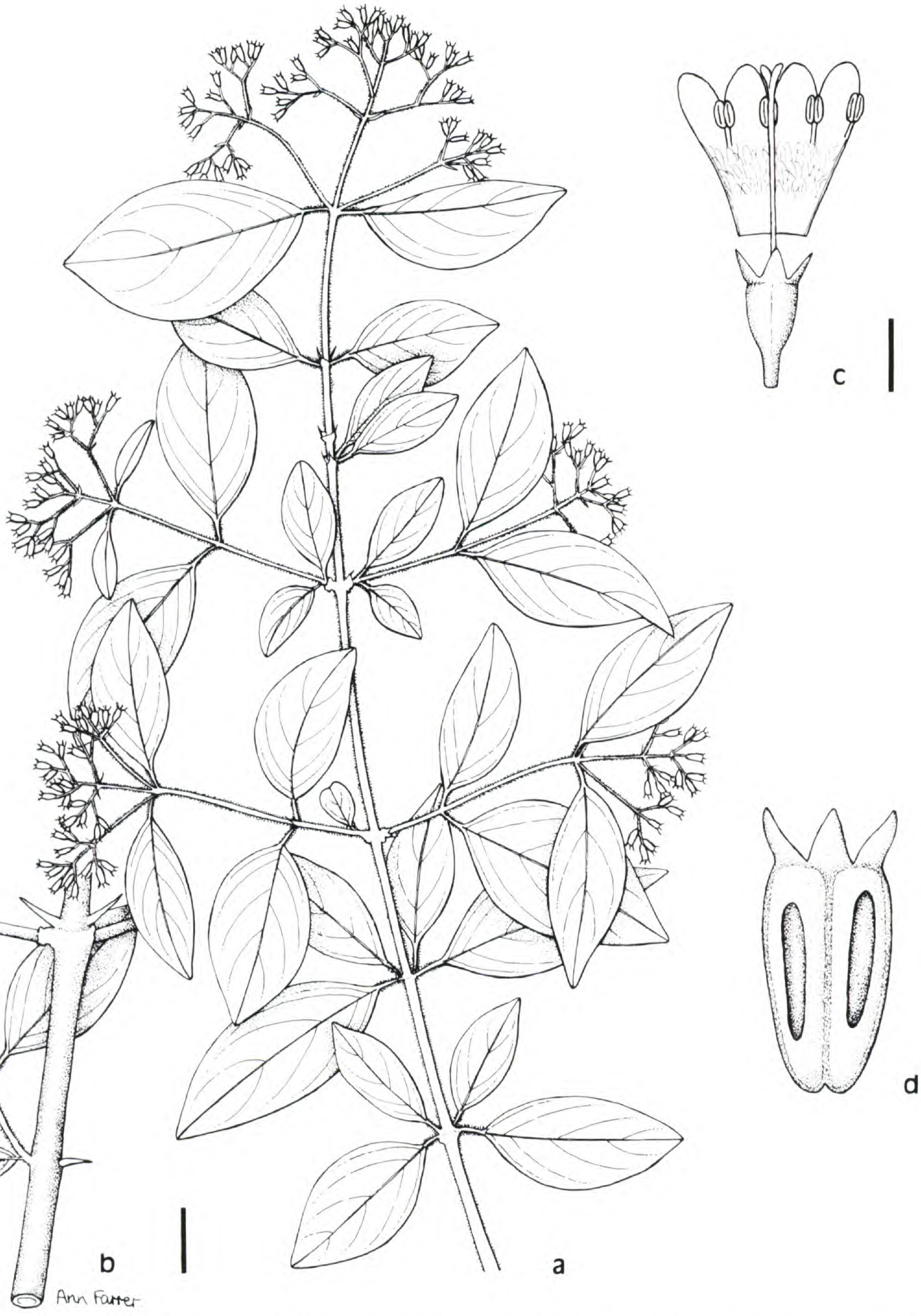

Figure 3. *Machaonia martinezorum* Lorence. —a. Habit. —b. Detail of stem, showing paired spines. —c. Flower, corolla opened. —d. Detail of fruit. a, *Martínez 18995* (PTBG); b–d, *Martínez 19016* (PTBG). Bars = 1 cm in a, b, 1 mm in c, and 2 mm in d.

Habitat. Lowland tropical wet forest subject to flooding, thickets along lagunas, and secondary forest, 14–160 m elevation. Flowering in May and June and fruiting in June.

Machaonia martinezorum is most closely allied to *M. martinicensis*, a species with glabrous leaves (except for the barbate vein axils beneath) having more numerous secondary veins (5–7 pairs), 5 calyx

lobes, a shorter corolla tube 1.5 mm long and densely villous within, and larger turbinate, non-corky fruits to 6 mm long. *Machaonia martinicensis* is known from Jamaica and in Mesoamerica from southern Nicaragua to Colombia. The corky thickenings covering most of the fruit surface in *M. martinezorum* are unusual and may be an adaptation to flotation and water dispersal. Also diagnostic are the relatively small, slender spines. The Martínez-Calderón collection from Oaxaca differs in having a more densely pubescent inflorescence with scattered hairs on the hypanthium but corresponds with material from Chiapas and Guatemala.

I dedicate this new species to two of its collectors having the *apellido* Martínez: Esteban Martínez S. and the late Guadelupe Martínez-Calderón, both of whom have made outstanding botanical collections for the Herbario Nacional de México.

Paratypes. MEXICO. **Oaxaca:** Distrito de Tuxtepec, Plan de Aguila, Chiltepec, 12 May 1967, *G. Martínez-C. 1397* (MEXU, MO). **Chiapas:** Municipio de Ocosingo, a 50 km al S de boca Lacantum, 130 m, 24 June 1986, *E. Martínez S. 18995* (MEXU, MO, PTBG). GUATEMALA. **Petén:** Cardenas/Puerto Méndez, bordering road, km 166, 20 May 1970, *E. Contreras 9849* (MO, TEX-LL); El Rosario, the FAO-FYDEP camp at Sayaxche, thickets along small laguna, 160 m, 19 June 1971, *Harmon & Fuentes 5784* (MO).

Psychotria breedlovei Lorence, sp. nov. TYPE: Mexico. Chiapas: Municipio La Trinitaria, a 1 km al E de Tziscao o a 11 km al E de la entrada al Parque Nacional Lagos de Montebello, 16°05′N, 91°39′W, 1,330 m, 9 ago. 1985, *T. Chehaibar 170* (holotype, PTBG; isotypes, MEXU, UAMIZ). Figure 4.

Species *Psychotriae sousae* Lorence & Dwyer affinis, sed pubescentia papilloso-puberula, stipulis majoribus 3–4 mm longis, 3–4 mm latis, inflorescentia 24–26-flora, cupula calycina breviore 0.5–0.7 mm longa, fructibus minoribus 6–8 mm diametro differt.

Shrub or small tree (1–)4–6 m tall, the leafy twigs cylindrical or slightly compressed, 2–3 mm diam., minutely and persistently papillose-puberulent, the internodes 1.5–7 cm long. Leaves of a pair at a node subequal, one slightly larger than the other; petioles of a pair subequal or unequal, one up to twice as long as the other, (5–)7–23 × 1 mm, minutely papillose-puberulent; lamina elliptic to narrowly elliptic, (6–)8–16 × 2–6.5 cm, chartaceous, drying grayish or brownish green, discolorous, adaxially glabrous, abaxially glabrous except minutely papillose-puberulent or hirtellous along costa and 2° veins, the base cuneate, the apex acuminate, the acumen 1–1.5 cm long, often falcate, the 2° veins 5–7 pairs, weakly festooned brochidodromous, the intersecondary veins 1–3, prominent abaxially, perpendicular to costa, the venation prominent and visible to 4° on both surfaces, the margins slightly callose; stipules persistent, broadly triangular or rounded, 3–4 × 3–5 mm, the apex often shallowly bilobed, the basal 1–2 mm united into a short cylinder, becoming thickened and accrescent with age, externally glabrous, internally densely white sericeous, the hairs mixed with pale brown digitate colleters 0.5–1 mm long. Inflorescence terminal, cymose-corymbiform, 24–26-flowered, 3 × 2 cm in flower (including the corollas), 5–5.5 × 4–5 cm in fruit, pedunculate, the peduncle 0.6–0.7 cm long in flower, 2–3 cm long in fruit, the axes minutely papillose-puberulent, the 1° branches in a whorl of 3, 4–5 mm long in flower, 17–20 mm long in fruit, the main axis 1 cm long, the 1° branches unbranched or branching once, ending in umbelliform 2–6-flowered cymules subtended by triangular bracteoles 1–2 mm long; flowers subsessile, the pedicels 0.3 mm long, subtended by 1–2 triangular ciliolate bracteoles 0.2–0.3 mm long, the hypanthium broadly cylindrical, 1–1.2 × 1.2–1.5 mm, minutely papillose-puberulent, the calyx cup obconical, 0.5–0.7 mm deep, the (4–)5 lobes triangular, usually acuminate, 0.3–0.5 mm long, the margin minutely ciliolate; corolla salverform, white when fresh, externally minutely papillose-puberulent, the tube 15–16 × 1 mm medially, internally with a brown villous ring 3–4 mm long medially, the lobes (4–)5, recurved, clawed adaxially, narrowly lanceolate, 4–5 × 1 mm, the stamens (4–)5, in short-styled flowers attached 1–2 mm below apex of tube, the filaments 1.5–2 mm long, the anthers linear-ellipsoid, 3 mm long, bilobed basally, exserted for 2 mm; style glabrous, included in short-styled flowers, 12–14 mm long, the 2 linear-ellipsoid stigmas 2–3 mm long, the disc conical, 0.7 mm long; long-styled flowers not seen. Fruits spheroidal, 6–8 mm diam., glabrous, ripening blackish, the apex with low, persistent calyx and nipplelike disc, the pyrenes with 3 low, dorsal ridges.

Distribution. Known only from the eastern highlands of Chiapas, Mexico, in the vicinity of La Trinitaria and the Parque Nacional Lagos de Montebello, near the border with Guatemala.

Habitat. Montane cloud forest with *Pinus*, *Quercus*, and *Liquidambar* at 1,300–1,400 m elevation. Flowering in August and fruiting in January, April, and June.

Psychotria breedlovei belongs to subgenus *Heteropsychotria* Steyermark. This new species is related to the group of Mexican and Central American taxa with long, white salverform corollas including *P. faxlucens* Lorence & Dwyer, *P. megalantha*

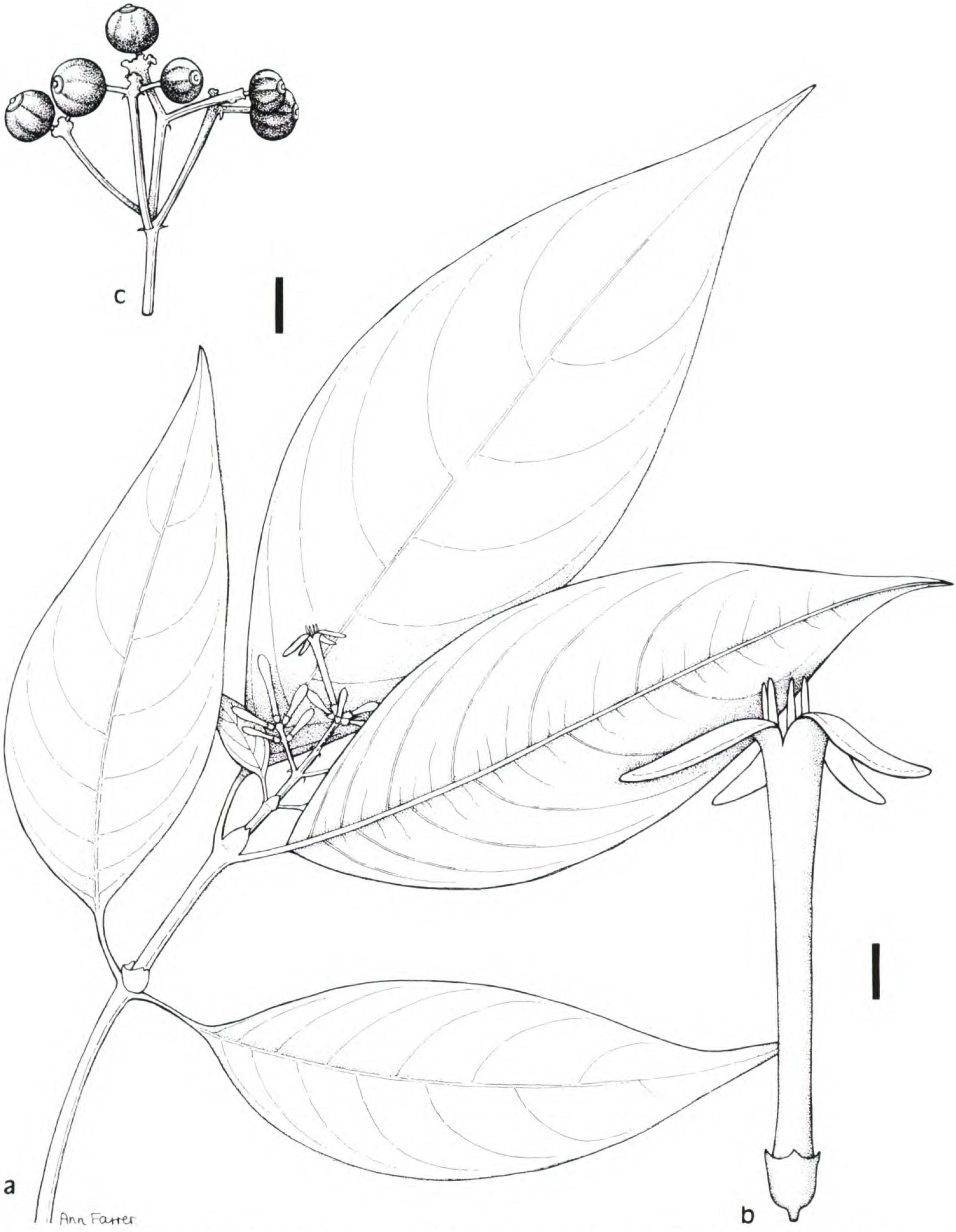

Figure 4. *Psychotria breedlovei* Lorence. —a. Habit, flowering twig. —b. Detail of short-styled flower. —c. Infructescence with fruits. a, b, *Chehaibar 170* (PTBG); c, *Cabrera 2948* (PTBG). Bars = 1 cm in a, c, and 2 mm in b.

Lorence, and *P. sousae* Lorence & Dwyer (Lorence & Dwyer, 1987). *Psychotria breedlovei* is most closely allied to *P. sousae* from Mexico, a completely glabrous species with smaller and thinner stipules, a 7–10-flowered inflorescence, longer and deeper, subentire calycine cups 1.5–2 mm long, and larger ellipsoid fruits 9–10 mm long. *Psychotria breedlovei* also shows affinity to *P. umbelliformis* Dwyer

& Hayden from Panama, a species differing by its abaxially densely villosulous leaves with 6–10 pairs of secondary veins, puberulent inflorescence with a longer peduncle 3–4 cm long, puberulent flowers with a longer calyx cup 2.5 mm long, and larger oblong fruits to 1.8 cm long. This species is named for Dennis E. Breedlove in recognition of his contributions to the *Flora of Chiapas* project.

Paratypes. MEXICO. **Chiapas:** Municipio of La Trinitaria, Lagos de Montebello National Park, near Lago Montebello, 1,370 m, *Breedlove & Almeda 57476* (CAS, MEXU); a 5 km al W de Lago Tziscao, Parque Nacional Lagos de Montebello, *Cabrera et al. 2948* (MEXU, PTBG); a 1 km al E de Tziscao o a 11 km al E de la entrada al Parque Nacional Lagos de Montebello, 1,330 m, *Chehaibar 170* (MEXU, PTBG, UAMIZ); E of Lagos de Montebello, 1.6 km beyond Ojo de Agua at ca. km 16, 1,330 m, *Croat 46694* (MO); Colonia Cuahutemoc Trinitaria, km 18, *Shilom Ton 8189* (MEXU, MO).

Psychotria thornei Lorence, sp. nov. TYPE: Mexico. Chiapas: Selva Negra, ca. 15 km N of Pueblo Nuevo Solistahuacán, canyon with montane rainforest of Selva Negra on slopes, elev. 5,700 ft., 24 June 1970, *R. Thorne & E. Lathrop 40389b* (holotype, CAS; photo PTBG). Figure 5.

Species *Psychotriae ostreophorae* (Wernham) C. M. Taylor affinis sed petiolis longioribus 3–11 mm longis, lamina basi acuta leviter attenuata, inflorescentia minore angustiore, pedunculo longiore 20–40 mm longo, capitulo 7–15 mm diametro, bracteis minoribus brunneo-viridibus et paribus externis basin versus connatis differt.

Shrubs to 3 m tall, the twigs slender, yellowish green, 1–1.8 mm diam., longitudinally wrinkled, sparsely strigillose when young, glabrescent, the internodes 0.8–3.5 cm long. Leaves opposite, shortly petiolate; petioles 2–11 × 0.4–0.6 mm, adaxially flattened, sparsely strigillose when young; lamina ovate-elliptic to elliptic, 3.5–8.5 × 1.3–3.5 cm, stiffly chartaceous, discolorous, drying grayish green, adaxially glabrous, dull, with numerous raphides visible, abaxially paler, glabrous except for spreading hairs basally along the costa, the base acute, slightly attenuate, the apex acuminate, the acumen 5–10 mm long, the 2° veins 5–7 pairs, strongly arcuate, camptodromous, the venation visible to 3° adaxially, abaxially prominent and stramineous, visible to 4°, the margin thin, slightly revolute; stipules persistent, interpetiolar, the sheath 1 mm long, the margin truncate, with 2 lateral subulate awns 2–3 × 0.4–0.5 mm, externally glabrous or sparsely strigillose, internally villosulous. Inflorescence terminal, solitary, the peduncle 20–40 × 1–1.5 mm, thicker distally, glabrous, the head subglobose, 7–8 × 7–15 mm, the bracts in 2(–3) pairs, dull greenish brown, glabrous, coriaceous, the bracts of the outer pair 8–20 × 5–10 mm, broadly ovate, connate basally, apically acuminate, the costa prominent dorsally, the margins ciliolate, the bracts of the inner pair(s) somewhat smaller; flowers 5–7 per head, distylous, the hypanthium obconical, glabrous, 1 mm long, the calyx cup cylindrical, 4–5 mm long, splitting halfway down one side, glabrous internally and externally, the calyx lobes usually 5, irregular, deltoid-ligulate or deltoid-ovate, 1.5–2.5 mm long, the margin fimbriate-laciniate; corolla waxy-white when fresh, salverform, the tube 16–17 × 1 mm medially, glabrous internally and externally, the lobes 5, ligulate-lanceolate, 9–10 × 1–1.5 mm, the apex hirtellous, clawed, short-styled flowers with anthers partly exserted, the anthers ellipsoid, 1.5 × 0.5 mm, the filaments 1.5–2 mm long; style 9 mm long, the 2 filiform stigma lobes 3 mm long, papillose, the disc cylindrical, 1 mm long; long-styled flowers not seen. Fruits 1–2 per head, ellipsoid, 7–8 × 4–5 mm, slightly bisulcate, smooth, drying greenish brown, crowned by the persistent calyx 2–3 mm long; pyrenes 7–8 × 4–4.5 mm, with 4 low dorsal ribs and a shallow ventral invagination.

Distribution. Mexico, Chiapas, known only from the vicinity of Jitotol, Pueblo Nuevo Solistahuacán, and Rayón.

Habitat. Montane mesophytic and cloud forest at 1,600–1,770 m elevation with *Pinus*, *Quercus*, *Liquidambar*, *Nyssa*, and *Brunellia*. Flowering in June and fruiting in September.

Cephaëlis has traditionally been recognized as a generic unit in a number of floristic treatments (Dwyer, 1980; Standley & Williams, 1975) and revisions (Molina R., 1953) for Central America and the Antilles. However, Steyermark (1972) gave a number of compelling reasons, discussed in detail by Taylor et al. (1991), for reducing *Cephaëlis* to synonymy under *Psychotria* subg. *Heteropsychotria*. *Cephaëlis* will be included under *Psychotria* for the *Flora Mesoamericana* Rubiaceae treatment (Dwyer & Lorence, in prep.), and this new taxon is described in *Psychotria* subg. *Heteropsychotria*. I am pleased to name the species for Robert Thorne.

Among the Mexican and Central American species of *Psychotria*, *P. thornei* is most closely allied to *Cephaëlis chiapensis* (Standley) Standley (= *Psychotria ostreophora* (Wernham) C. M. Taylor, fide Taylor & Pool (in press), also known as *P. lucentifolia* (Blake) Steyermark), to which it keys out in the treatments of Molina R. (1953) and Standley & Williams (1975). *Psychotria ostreophora* is easily distinguished by its subsessile, basally obtuse or rounded, adaxially lustrous leaves with fewer raph-

Figure 5. *Psychotria thornei* Lorence. —a. Habit. —b. Fruit. —c. Seed, ventral view. —d. Seed, side view. —e. Seed, dorsal view. —f. Flower. a, f, *Thorne & Lathrop 40389B* (CAS); b–e, *Thorne & Lathrop 41688* (CAS). Bars = 1 cm in a, b, 7 mm in c–e, 2 cm in f.

ides visible, longer and more slender stipule awns (3–)5–12 mm long attached outside the sheath, shorter, more slender floral peduncles 1–2 cm long, and larger heads with broadly ovate bracts that are free to their bases.

Paratypes. MEXICO. **Chiapas:** Municipio of Rayón, 9 mi. NW of Pueblo Nuevo Solistahuacán, along road between Rincón Chamula and Rayón, Jitotol Ridge, 5,800 ft., Sep. 1971, *Thorne & Lathrop 41688* (CAS); Solistahuacán area, Selva Negra (mountains above the Linda Vista Biological Station near Pueblo Nuevo), 5,700 ft., *Clarke 700624-117* (CAS); Municipio of Jitotol, 5 km SE of Jitotol along road to Bochil, 1,600 m, 10 Sep. 1981, *D. Breedlove 52671* (CAS, MEXU).

Rondeletia breedlovei Lorence, sp. nov. TYPE: Mexico. Chiapas: Municipio of Tenejapa, paraje of Mahben Chauk, on slopes along the Tana Te' River near Sahal K'esh, elevation 2,900 ft. (884 m), 27 Nov. 1964, *D. E. Breedlove 7682* (holotype, F no. 1617735; isotype, CAS). Figure 6.

Species *Rondeletiae subscandenti* Lundell affinis, sed pubescentia flavida hirtella ex trichomatibus 0.4–0.6 mm longis constanti, foliis hirtellis lamina ovato-elliptica 4.5–10.5 × 2–4.7 cm, petiolo breviore 3–4 mm longo, axibus inflorescentiae dense hirtellis, corolla rosea extus hirtella differt.

Scandent shrub (label says "perennial vine") or small tree 3 m tall, the leafy twigs terete, 1–2 mm diam., densely hirtellous when young, the trichomes pale yellow, 0.4–0.6 mm long, the internodes 2–4.5 cm long. Leaves opposite, those of a pair at a node equal, shortly petiolate; petioles 3–4 × 1 mm, densely hirtellous; lamina ovate to ovate-elliptic, 4.5–10.5 × 2–4.7 cm, chartaceous, drying brown, adaxially shiny, sparsely hirsutulous, abaxially hirtellous, densely so along the costa and veins, the base shallowly cordate to rounded, the apex acuminate, the acumen to 1 cm long, the 2° veins 6–8 pairs, festooned brochidodromous, the venation usually whitish adaxially, very prominent and visible to 5° on both surfaces, the margins ciliolate, slightly revolute; stipules erect, dark brown, 5–6.5 × 1–1.5 mm, linear-subulate, strigillose. Inflorescences terminal or axillary in distal 1–2 leaf pairs, 12–40-flowered, corymbiform-cymose, 5.5–7 × 4–6 cm (including corollas), the peduncle 2.7–3.5 cm long, or sessile and tripartite, the 1° branches 3, 2–2.5 cm long, the 2° (ultimate) branches bearing cymules of 3–5 flowers, subtended by linear-subulate bracteoles 1.5–2.5 mm long, the axes densely hirtellous with pale spreading trichomes; flowers distylous, on slender hirtellous pedicels 1–2 mm long, the hypanthium subglobose, compressed, 1–1.3 × 1–1.3 mm, densely hirtellous, the calyx cup 0.2 mm deep, the calyx lobes 4 (occasionally 5 or 6), unequal and intergrading in size, linear-subulate to narrowly oblanceolate, 1–2.8 × 0.2–0.5 mm, hirtellous, each sinus with a small brown colleter; corolla salverform, pink when fresh, the tube 15–17 × 0.7–0.8 mm medially, externally hirtellous-villosulous with spreading white trichomes 0.4–0.5 mm long, internally with scattered hairs medially, the lobes 5, spreading, obovate-subcircular, 2.5–3.5 × 2–2.5 mm, externally hirtellous-villosulous basally, internally papillose-puberulent basally, the throat with a ring of pale yellow trichomes, the stamens sessile, the anthers linear-ellipsoid, 1.4–1.5 mm long, in short-styled flowers attached 1 mm below apex of tube, the tips visible; style glabrous, in short-styled flowers 10 mm long, the stigmas linear, 2 mm long, the disc annular, glabrous; long-styled flowers not seen. Fruits globose, 4–5 mm diam., hirtellous; seeds not seen.

Distribution and habitat. Known only from the Municipio of Tenejapa in central Chiapas at 800–900 m elevation, presumably in lower montane wet or rainforest. Flowering in November and fruiting in December.

Rondeletia breedlovei is distinguished by its sometimes scandent habit, shortly petiolate ovate or ovate-elliptic leaves with shallowly cordate to rounded bases, prominent venation drying white above, and densely hirtellous-villosulous pubescence on the stems, leaves, and inflorescence. It is closely related to *R. subscandens* Lundell, another scandent species from Guatemala that differs in being nearly glabrous and having much larger and diffusely branched inflorescences to 13 cm long, minute calyx lobes 0.3 mm long, and externally glabrous red corollas. Both species are characterized by their 5-merous corollas that are yellow-barbate around the throat.

Paratype. MEXICO. **Chiapas:** Municipio de Tenejapa, Río Cruz Pilal, 800 m, 20 dic. 1982, *A. Méndez Ton (A. Shilom Ton) 5295* (MEXU).

Rondeletia chiriquiana Lorence, sp. nov. TYPE: Panama. Chiriquí: Fortuna Dam area, along shores of Río Chiriquí where it enters reservoir, 1,000 m, 8°45'N, 82°13'W, 2 Aug. 1984, *H. W. Churchill 5924* (holotype, MO no. 3595277). Figure 7.

Species *Rondeletiae monteverdensi* Lorence affinis, sed bracteis minoribus, 1.5–3.5 × 0.3–0.6 mm, lobis calycinis minoribus, 2–5 × 0.3–1.5 mm, corolla extus glabrata vel strigoso-sericea differt.

Shrub or small tree to 3.5 m tall, the twigs trigonous to cylindrical, 1.5–3 mm diam., ascending

Figure 6. *Rondeletia breedlovei* Lorence. —a. Habit. —b. Corolla, short-styled flower. —c. Corolla opened. —d. Hypanthium and calyx, split longitudinally to show locules and numerous ovules (*Breedlove 7682*, F). Bars = 1 cm in a–c, 4 mm in d.

Figure 7. *Rondeletia chiriquiana* Lorence. —a. Habit, flowering twig. —b. Habit, fruiting twig. —c. Corolla opened. —d. Gynoecium with calyx lobes and style. —e. Fruit. a, *Churchill 5924* (MO); b, e, *Correa et al. 2698* (F); c, d, *Hammel 2333* (MO). Bars = 1 cm in a, b, 17 mm in c, 16 mm in d, 4 mm in e.

sericeous or strigillose, especially when young, the older stems glabrate, the trichomes white or pale brown, thin, straight or curved, 0.2–0.6 mm long, the internodes 1–5 cm long. Leaves in whorls of 3, those at a node subequal to unequal, one up to 50% larger than the others, petiolate; petioles 4–10 mm long, 0.6–1 mm diam., narrowly winged, strigose-strigillose or glabrate; lamina elliptic, narrowly elliptic, or narrowly oblanceolate, 3–9 × 1–2.8 cm, stiffly chartaceous, drying discolorous, when young both surfaces sparsely sericeous with very thin, fragile white hairs to 1 mm long, adaxially often glabrate, abaxially with hairs persisting along costa and veins, the base acute or narrowly cuneate, often attenuate, the apex acute, the tip abruptly long acuminate, 0.8–2 cm long, the 2° veins 4–6 pairs, arcuate, camptodromous, the venation adaxially obscure and visible to 2° or 3°, abaxially dark and visible to 3° or 4°, the margin slightly revolute; stipules narrowly triangular, acuminate, erect, rigid, 2.5–4 × 1.5–2 mm, united into a short sheath 0.3–0.4 mm long, externally sparsely strigillose, internally densely white-sericeous, the margins fringed with black colleters. Inflorescence terminal, corymbiform-cymose, 5–8 × 3–4 cm (including the corollas), ca. 20–40-flowered, the peduncle trigonous, 1.5–3 cm × 1–1.5 mm, strigillose-sericeous, the axes strigillose-sericeous, the 1° branches in 2–3 whorls of 3 separated by short internodes 5–25 mm long, each 1° branch 5–12 mm long, subtended by a leaflike bract 13–35 × 3–11 mm, terminated by 2–5-flowered dichasia, the ultimate axes and flowers subtended by linear bracteoles 1.5–3.5 × 0.3–0.6 mm; flowers 4-merous, distylous, on strigillose pedicels 0.5–4 mm long, the hypanthium turbinate-cylindrical, 1.3–1.5 × 0.8–1 mm, sparsely or densely strigose-sericeous, the calyx cup 0.4–0.6 mm deep, the calyx lobes erect-spreading, sparsely or densely strigose, foliaceous, venose, unequal, the 3 smaller lobes linear, 2–3 × 0.3–0.5 mm, the large lobe narrowly elliptic or oblanceolate, 3.5–5 × 1–1.5 mm, each sinus usually with a small, dark brown globose colleter; corolla salverform at anthesis, yellow-green, white or pink when fresh, the tube 13–14 mm long, 1–1.3 mm wide distally, externally glabrate or strigose-sericeous, internally hirtellous in basal ⅓, the lobes spreading, subcircular, 2–2.5 × 2–2.5 mm, externally strigose toward base, internally glabrous, stamens sessile, anthers ellipsoid, 3 mm long, included in long-styled flowers, the tips exserted in short-styled flowers; style glabrous, 14 mm long in long-styled flowers, 5 mm long in short-styled flowers, the stigma lobes 0.8–1 mm long; disc 0.2 mm high. Capsules broadly ellipsoid or subglobose, 3.5–5 × 3.5–4 mm, 8-ribbed, glabrate or with scattered hairs, the calyx lobes persistent, spreading, dehiscence loculicidal then septicidal; seeds 0.5–0.6 mm long, irregularly angulate-cristate, testa brown, reticulate.

Distribution. Known only from the La Fortuna Dam area in the Chiriquí province of Panama.

Habitat. Lowland and lower montane rainforest from ca. 1,000 to 1,200 m elevation. Two of the collections were made from plants growing along a river or stream. Flowers were collected in March, August, and September and fruits in September.

Rondeletia chiriquiana is closely allied to *R. monteverdensis* Lorence, which differs in being glabrous or soon glabrescent throughout and by its larger floral bracteoles 4–5 mm long and larger calyx lobes, the 1–2 larger lobes oblanceolate, 8–11 mm long, the 2–3 smaller lobes linear-ligulate, (3–)5–7 mm long (Lorence, 1991). In spite of their similarity, these two species differ in a number of discrete morphological characters and are geographically separated. The new species is also related to *R. calycosa* J. D. Smith, which has similar-sized floral bracts and calyx lobes but differs in having consistently opposite leaves. *Rondeletia monteverdensis* is known only from the Cordillera de Guanacaste and Cordillera de Tilarán in northwestern Costa Rica at (1,200–)1,400 to 1,700 m elevation, and *R. calycosa* is known from the central highlands of Costa Rica on the Caribbean escarpment at 1,100–1,700 m elevation.

Paratypes. PANAMA. **Chiriquí:** La Fortuna hydroelectric project, trail along Hornito river drainage back to present end of road, 25 Mar. 1978, *Hammel 2333* (MO); NE del campamento de Fortuna (Hornito sitio de prensa), 8°45′N, 82°15′W, 1,000–1,200 m, 24 Sep. 1976, *Correa A. et al. 2698* (F).

Rondeletia megalantha Lorence, sp. nov. TYPE: Honduras. Cuyamel [Dept. Cortés, 15°38′N, 88°12′W, ca. 100–200 m elevation], 23 Aug. 1924, *M. A. Carleton 653* (holotype, US no. 1208409; isotype, US no. 1208410). Figure 8.

Species pubescentia hirsuta ex trichomatibus 2–3 mm longis constanti, lobis calycinis 9–19 mm longis, 1–3 mm latis, corollae magnae tubo 30–32 mm longo, lobis 10–15 mm longis, 8–12 mm latis a congeneribus bene distincta.

Habit unknown, presumably a shrub or small tree, the leafy twigs 2–3 mm diam., when young hirsute, later glabrescent, the trichomes 2–3 mm long, pale brown to whitish, simple, septate, often twisted, the internodes 1.5–6 cm long. Leaves opposite, those of a pair at a node subequal or somewhat unequal,

Figure 8. *Rondeletia megalantha* Lorence (*Carleton 653* (based on holotype, US, and isotype, US)). Bar = 1 cm.

petiolate; petioles (0.6–)1–3.3 cm long, 0.8–1.2 mm diam., hirsute; lamina elliptic or broadly elliptic, 8–14.5 × 3.2–9 cm, chartaceous, drying dark brown adaxially, paler greenish brown abaxially, adaxially hirsute with scattered pale brown to whitish, often twisted septate hairs 2–3 mm long, abaxially hirsute, the hairs dense and spreading along costa and veins, the base acute to obtuse, the apex abruptly acuminate, the acumen 8–10 mm long, the 2° veins 9–12 pairs, slightly arching, weakly brochidodromous, the venation visible to 3°(–4°) on both surfaces, the margin ciliate; stipules persistent, erect, ovate, 14–17 × 10–11 mm, thin, brown, foliaceous, externally hirsute dorsally and on margins, internally villous basally with a densely white-villous ring at base. Inflorescence apparently terminal, becoming pseudo-axillary, cymose-corymbiform, 7–9-flowered, densely pale brown hirsute, the peduncle 2–5 cm × 0.8–1 mm, hirsute, the 1° branches 2, 6–10 mm long, each bearing 3–4 flowers and subtended by a linear-lanceolate or ovate–lanceolate, 3(–5)-lobed bract 8–10 × 3–4 mm, with a solitary flower in axil of the 1° branches; flowers 4-merous, on pedicels 2–5 × 0.6 mm, each subtended by a lanceolate, entire or 2–3-lobed bract 8–12 × 1–2 mm, the hypanthium 5–7 × 3–4.5 mm, bisulcate, hirsute, the calyx cup 1 mm deep, the lobes foliaceous, venose, unequal, the 3 smaller lobes linear-lanceolate, 9–11 × 1–1.5 mm, the larger lobe elliptic-lanceolate, 16–19 × 2.5–3 mm; corolla salverform at anthesis, white, the tube 30–32 mm long, 1.5–1.8 mm wide distally, externally hirute, the lobes spreading, obovate, 10–15 × 8–12 mm, externally hirsute to hirsutulous basally and along one side, internally papillose-puberulent, more densely so basally; stamens and style included (material not adequate for dissection). Capsules ovoid, compressed, bisulcate, 8–9 × 6–7 mm, old capsules with dehiscence septicidal and loculicidal, the pericarp disintegrating and leaving a loose basket of 6–8 vascular bundles around endocarp; seeds not seen.

Distribution and habitat. Known only from the type collection made near the Caribbean coast just east of the Guatemalan border, presumably in lowland rainforest. Flowers and old fruit were collected in August.

Rondeletia megalantha is characterized by its exceptionally large corollas, hence the specific epithet. This new species is most closely allied to *R.*

uxpanapensis Lorence & Castillo-Campos from Veracruz, Mexico, also with hirsute pubescence and large white corollas (Lorence & Castillo-Campos, 1988). The latter species differs in having shorter trichomes 0.5–1.5 mm long, smaller stipules 3–6 mm long, smaller floral bracts 3–6 mm long, and smaller corollas with the tube 13–19 mm long and the lobes 5–9 × 3–6 mm. *Rondeletia hondurensis* J. D. Smith from Honduras also has large white flowers but differs in having leaves that are whitish pannose-tomentose beneath, stipules fused into an intrapetiolar sheath with 1–3 aristate lobes, and densely appressed-pubescent, 5-merous corollas.

Sommera parva Lorence, sp. nov. TYPE: Mexico. Chiapas: Municipio de Tila, Pie de Cerro "K'abana," 900 m, 1 July 1982, *Alush Méndez Ton* (*Alush Shilom Ton*) *4367* (holotype, MEXU; isotypes, BM, F, MO, NY, PTBG, US, XAL). Figure 9.

Species insigniter habitu fruticoso 50–100 cm alto, lamina 35–105 × 8–25 mm, petiolis 2–10 mm longis, floribus parvis, corollae tubo 3–4 mm longo et lobis 2–3 mm longis a congeneribus bene distincta.

Shrub or treelet 0.5–1 m tall, the branches virgate, the twigs 1.5–2 mm diam., compressed, moderately to densely strigillose-hirtellous, the trichomes pale fulvous, setose, unicellular, the larger ones to 0.7 mm long, mixed with much shorter ones, the internodes 0.4–2.5(–5) cm long. Leaves opposite, petiolate, those of a pair subequal to unequal; petioles 2–10 × 0.6–1 mm, moderately to densely strigillose, adaxially flattened or canaliculate, slightly winged distally; lamina oblanceolate to narrowly obovate, 3.5–10.5 × 0.8–2.5 cm, chartaceous, slightly discolorous, drying green to brownish green, both surfaces strigillose-setose along the costa and veins, the intervenal areas sparsely hirtellous-setose, the base narrowly cuneate, slightly decurrent, the apex acuminate, the acumen 7–11 mm long, falcate, the 2° veins 7–9 pairs, weakly festooned brochidodromous, the 3° veins numerous, reticulate, the 4° veins parallel and striate within the 3° areoles, the venation visible to 3° adaxially, prominent and visible to 4° abaxially, the margin callose, ciliolate, finely and irregularly sinuate-denticulate; stipules caducous, narrowly triangular, 10–13 × 2.5–3.5 mm basally, carinate, externally strigillose dorsally, internally glabrous, the margins scarious. Inflorescence axillary, solitary, a 3–9-flowered dichasium or thyrse, 2–4 × 1.5–2 cm, the axes densely strigillose-hirtellous, the peduncles 8–30 × 1 mm, compressed, the 1° branches bracteolate, the bracteoles lanceolate, 3–10 mm long, carinate, strigillose-hirtellous; flowers 5(rarely 4)-merous, on pedicels 1–3 mm long, the hypanthium broadly turbinate, 1–1.5 × 1–1.5 mm, costate, densely strigillose, the calyx cup 0.5–0.7 mm deep, the calyx lobes unequal or rarely equal, elliptic to oblanceolate, 2–4 × 1–2 mm, venose, externally hirtellous-strigillose, internally hirtellous, the apex acute to obtuse; corolla scarcely exceeding the calyx, yellow when fresh, at anthesis shortly tubular, the tube 3–4 × 1.2–1.8 mm distally, externally finely strigillose, the basal half glabrous, internally glabrous below the stamens, the throat densely villosulous-barbate, the corolla lobes thick, ovate to elliptic, 2–3 × 1–1.5 mm, externally finely hirtellous-papillose, internally densely villosulous-papillose medially to the base, the apex acute; stamens included, the anthers ellipsoid, 1–1.2 mm long, the filaments 1.2–1.4 mm long, villosulous, affixed midway in the tube; style slightly exserted, 4.6–4.8 mm long, densely villosulous in distal half, the 2 villosulous stigmas 1.2–1.4 mm long, the disc low, 1 mm diam. Fruits subglobose, 7–8 mm diam., baccate, glabrate, crowned by the persistent calyx; seeds numerous, light brown, irregularly elliptic or ovoid, angulate, 1.3–1.9 mm long, the testa foveolate.

Distribution. Mexico, known only from north-central Chiapas near the towns of Petalcingo and Tila. Flowering in May and fruiting in October and December.

Habitat. Lower montane and montane evergreen rainforest from about 900 to 1,700 m elevation.

Sommera is a genus of approximately 13 species occurring in southern Mexico, Central America, and South America to Peru and Brazil. L. O. Williams (1973) reviewed the Central American and Mexican species but failed to provide a key or illustrate the four species he described as new. *Sommera parva* is easily distinguished from its congeners by the following combination of characters: small habit, small oblanceolate leaves, and small flowers with unequal calyx lobes. *Sommera fusca* Oersted ex Standley from Oaxaca also has comparatively small leaves, but they are elliptic and much broader than those of *S. parva*. The only other species with strongly unequal calyx lobes is *S. arborescens* Schlechtendal from Oaxaca, Veracruz, Chiapas, and Guatemala, but it has much larger, glabrous or pilose-strigose leaves 7–29 × 1.8–12 cm with more numerous secondary veins (9–13 pairs) that are barbate in the axils below.

Paratypes. MEXICO. **Chiapas:** Mun. of Huitiupan (as "Peltalcingo"), Ahk'ulbal Nab above Petalcingo (as "Peltalcingo"), 1,700 m, *Breedlove 56138* (MEXU); Mun. de Tila, Pie del Cerro Ak'bana, 800 m, *A. Méndez*

Figure 9. *Sommera parva* Lorence. —a. Habit. —b. Habit, fruiting twig. —c. Gynoecium with calyx opened to show style. —d. Corolla, opened. —e. Fruit. a, *Méndez Ton 4367* (PTBG); b, e, *Méndez Ton 4953* (PTBG); c, d, *Méndez Ton 6007* (PTBG). Bars = 1 cm in a, b, 1 mm in c–e.

Ton 6007 (*A. Shilom Ton*) (MEXU, MO, PTBG); Mun. de Yajalón, Banco de Grava, 800 m, *A. Méndez Ton 4953* (*A. Shilom Ton*) (MEXU, MO, PTBG).

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Literature Cited

Anon. 1982. Flora Mesoamericana. Guia para autores. Guide for authors. Missouri Botanical Garden, Instituto de Biología, U.N.A.M., México, and British Museum (Natural History).

Blackwell, W. H. 1968. Revision of *Bouvardia* (Rubiaceae). Ann. Missouri Bot. Gard. 55: 1–30.

Dwyer, J. D. 1980. *Cephaëlis*. *In:* Flora of Panama. Rubiaceae. Ann. Missouri Bot. Gard. 67: 59–82.

Lorence, D. H. 1991. New species and combinations in Mexican and Central American *Rondeletia* (Rubiaceae). Novon 1: 135–157.

——— & G. Castillo-Campos. 1988. Tres nuevas especies y una nueva combinación en el género *Rondeletia* (Rubiaceae, Rondeletieae) de Veracruz y Oaxaca, México. Biotica 13: 147–157.

——— & J. D. Dwyer. 1987. New taxa in Mexican *Psychotria* (Rubiaceae, Psychotrieae). Bol. Soc. Bot. México 47: 49–64.

MacDougall, T. 1971. The Chima wilderness. Explorer's J. 49: 86–103.

Molina R., A. 1953. Revisión de las especies de Cephaëlis de México, Centro America y las Antillas. Ceiba 4: 1–38.

Standley, P. C. & L. O. Williams. 1975. *Cephaëlis*. *In:* Flora of Guatemala. Rubiaceae. Fieldiana: Bot. 24(11): 57–60.

Steyermark, J. A. 1972. *Psychotria*. *In:* The botany of the Guayana Highland—Part IX. Rubiaceae. Mem. New York Bot. Gard. 23: 227–832.

Stix, J. A. 1975. Thomas Baille MacDougall—Naturalist and collector. Curator 18: 270–276.

Taylor, C. M. & A. Pool. Taxonomic notes on *Psychotria* (Rubiaceae) in western South America. (In press.)

———, B. E. Hammel & W. C. Burger. 1991. New species, combinations, and records in Rubiaceae from the La Selva Biological Station, Costa Rica. Selbyana 12: 134–140.

Williams, L. O. 1973. *Sommera* (Rubiaceae) in North America. Phytologia 26: 121–126.

Kanaloa, a New Genus of Fabaceae (Mimosoideae) from Hawaii

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ABSTRACT. *Kanaloa kahoolawensis* Lorence & K. R. Wood, a new genus and species of Fabaceae subfamily Mimosoideae tribe Mimoseae, is described from the Hawaiian Island of Kaho'olawe. Based on morphology, wood anatomy, pollen structure, and chromosome number ($2n = 28$), *Kanaloa* is described as a monotypic genus of shrubs allied to genera belonging to the *Leucaena* and *Dichrostachys* groups of Mimoseae, from which it is differentiated by its tergeminate leaves, monospermous fruits inertly dehiscent along two sutures with the valves separating into inner and outer envelopes, and large cordiform seeds. The new genus is extremely rare and currently known from only two remaining plants on Kaho'olawe, a small, arid, and highly disturbed island. Fossil pollen attributable to *Kanaloa* has been found in core samples from lowland sites on O'ahu dating to the early Pleistocene.

Because of their great isolation and considerable age, the Hawaiian Islands harbor a unique and remarkable flora with a higher degree of endemism—about 90% of the angiosperms—than any comparable area of the world. These islands have been relatively well botanized, and the angiosperm flora of Hawai'i is well known from a modern floristic treatment (Wagner et al., 1990). Therefore, the discovery of an unusual leguminous shrub not assignable to any genus known from Hawai'i was an unexpected surprise, particularly on an island as small and degraded as Kaho'olawe.

Kaho'olawe is the smallest of the major Hawaiian Islands (Fig. 1), with a surface area of 116 km^2 and a maximum elevation of 450 m. The island is arid due to its low elevation and location in the rain shadow of the much larger Maui. Study of the numerous archaeological sites on Kaho'olawe indicates it was inhabited by Hawaiians from about A.D. 1000, and by the time of Western contact in 1779 much of the island's vegetation had been cleared for agriculture (Kirch, 1985: 144–154). Kaho'olawe was used as a penal colony by the Hawaiian monarchy from 1826 to 1853 after which it was leased for ranching (Perlman, 1992). Although Kaho'olawe proved too dry and barren for successful ranching operations, feral goat and sheep populations became established and devastated the island's little remaining vegetation, resulting in massive soil erosion (Kirch, 1985). During World War II the island was appropriated by the U.S. military for training troops and as a target for ship-to-shore guns and aerial bombing. It is still used as a bombing target by the U.S. Navy. The central plateau of Kaho'olawe now consists of a barren lateritic hardpan whose soil has been lost by erosion. Conservation efforts to restore the island's vegetation and control feral animals are now being undertaken by the Department of Land and Natural Resources of the State of Hawai'i and the Protect Kaho'olawe 'Ohana, a native Hawaiian activist organization. There is currently a movement to return the island to the State of Hawai'i for management by ethnic Hawaiians, practice of Hawaiian culture, and educational purposes.

While participating in a botanical survey of Kaho'olawe conducted by The Nature Conservancy of Hawaii in March 1992, the second author and Steve Perlman, field collectors for the Hawaii Plant Conservation Center (HPCC) of the National Tropical Botanical Garden, found an unusual shrubby Fabaceae. Subsequent visits revealed a second individual located nearby. Both plants were confined to native coastal shrubland on 'Ale'ale Stack (Fig. 1), a steep rocky spire almost separated from the main island by erosion (Perlman, 1992). Herbarium specimens were studied by botanists familiar with the Pacific islands' flora and Fabaceae specialists, none of whom recognized the plant. It was also run through the keys in treatments for Hawaiian Fabaceae (Geesink et al., 1990; Rock, 1920) and for all known genera of Mimosoideae (Lewis & Elias, 1981) without arriving at a satisfactory generic placement. An examination of specimens at the BISH, NY, and PTBG herbaria yielded nothing comparable to this extraordinary plant. Subsequent study of the plant's morphology, wood anatomy, chromosome number, and pollen has convinced us that it represents a new genus with unclear affinities belonging to subfamily Mimosoideae, tribe Mimoseae.

Kanaloa kahoolawensis Lorence & K. R. Wood, gen. et sp. nov. TYPE: Hawaiian Islands. Kaho'olawe: Makawao District, 'Ale'ale stack, near Pu'u Koa'e, mixed native coastal shrubland, 45 m, 18 Mar. 1992, *K. R. Wood, S. Perlman, J. Lau & C. Rowland 1733* (holotype, PTBG; isotypes, BISH, US). Figure 2.

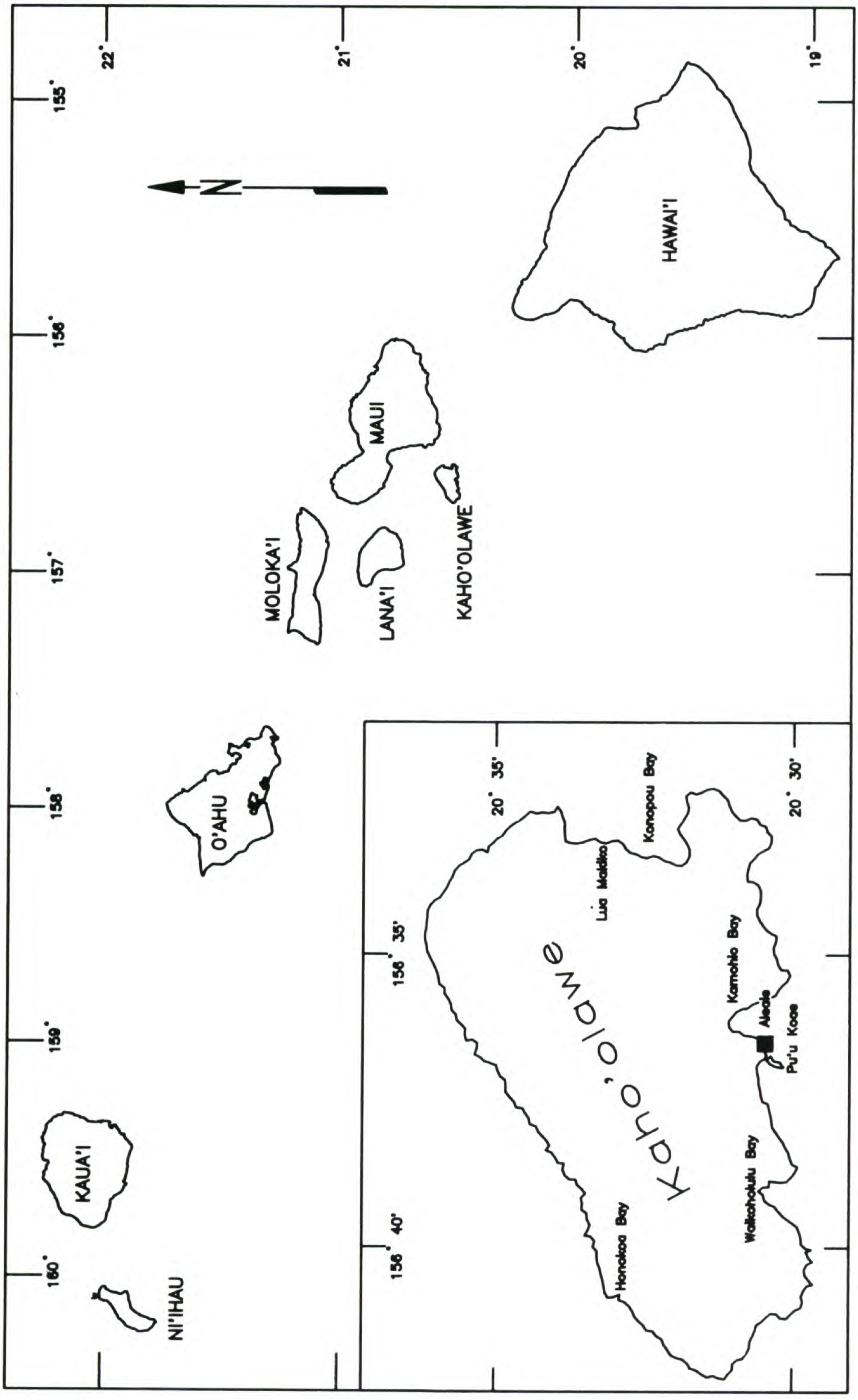

Figure 1. Map of main Hawaiian Islands, with inset of Kaho'olawe showing location of *Kanaloa* population.

Frutices inermes. *Folia* stipulis liberis, ovatis, crassis, persistentibus; petiolo apice nectarium cupuliforme sessile unicum adaxialiter gerenti; lamina tergeminata, i.e., pinnis duabus utraque apice foliolorum par unum etiam basi foliolum proximalem unicum gerenti. *Flores staminati* numerosi in capitulos globosos dispositi, 5-meri, unusquisque bractea peltata subtentus; calyce obconico, lobulis parvis alabastro valvatis; petalis alabastro valvatis, oblanceolatis; staminibus 10 exsertis, basi connatis, antheris ellipsoideis dorsifixis glabris extrorse dehiscentibus, polline tricolporatum in monates disperso. *Flores hermaphroditi* non visi. *Fructus* breviter stipitati bivalvati compressi, ex obovatis suborbiculares, utrinque dehiscentes, ut videtur uniseminales; endocarpio papyraceo ab exocarpio secedenti; semine compresso irregulariter cordiformi, pleurogramum humile immersum gerenti.

Shrubs 0.75–1 m tall, unarmed, densely branched, the branches decumbent, 0.75–1.5 m long, the new growth densely brown hirtellous-villosulous with straight and curly, white and brown simple trichomes 0.1–0.3 mm long, the twigs 2–4 mm diam., brown, longitudinally ribbed or angled, becoming whitish gray with corky fissures, knobby with large rounded buds and persistent stipules and leaf bases, the leaves clustered near twig tips, brachyblasts absent; stipules free, paired, ovate, 1.5–2 mm long, 1.2–1.5 mm wide, densely villosulous, the apex acute, antrorsely curved, the thickened bases persistent, transversely fissured; leaves tergeminately bipinnate, the petiole 6–24 mm long, 0.8–1 mm diam., white hirtellous and brown villosulous, apically with a single leaf nectary adaxially at junction with pinnae, 0.5–0.8 mm diam., ellipsoid, sessile, the margin hirtellous, the concavity glabrous; pinnae one pair, 22–55 mm long, each pinna bearing a pair of terminal leaflets and a single smaller proximal leaflet basally, the pulvinules hirtellous, 1–1.5 mm long, the rachis terminated by a short, acute brown appendage; leaflets unequal-sided, ovate-elliptic, 1.4–4.2 × 0.9–3.2 cm, the base truncate to subcordate, the apex obtuse or rounded, stiffly chartaceous, discolorous, finely strigillose below when young, the margin ciliolate, the 2° veins 3–4 on a side, the ultimate venation finely reticulate, visible to 5° on both surfaces. Inflorescences 1–3 per leaf axil, developing with a flush of new leaves, the peduncle 8–30 × 0.4 mm, hirtellous, the capitula 6–8 mm diam. including stamens; bracteoles 1–1.5 mm long, the peltate apex villosulous. Flowers white, 20–54 per capitulum. Staminate flowers with calyx limb obconic, 1–1.3 mm long, densely white villosulous in apical ⅓; calyx lobes 5, valvate in bud, 0.1–0.2 mm long, triangular, incurved, brown-villosulous; corolla valvate in bud, the petals 1.5–1.8 × 0.5–0.7 mm, oblanceolate, cucullate, apiculate, 1-veined, externally hirtellous apically, separate at base; stamens 10, exserted, the filaments 2–3 mm long, glabrous, connate at base, the anthers dorsifixed, ellipsoid, 0.6–0.8 mm long, glabrous, lacking glands, the dehiscence extrorse; vestigial gynoecium subsessile, 0.5–0.7 mm long, the stigma truncate; disc absent. Hermaphroditic flowers not seen. Pollen tricolporate, in monads. Fruits on a stipe 4–5 mm long, up to 4 per capitulum, 2.4–3.2 × 2–2.3 cm, obovate or subcircular, compressed, coriaceous, externally hirtellous basally, with transverse cross veins, 2-valved, inertly dehiscent along both thin margins, the valves separating into inner and outer envelopes, the slender brown seed funicle 2–3 mm long; seed 1 per fruit, cordiform, brown, 1–1.3 × 1.1–1.6 cm, with a low inset pleurogram. $2n = 28$.

Distribution. Known only from Kaho'olawe, where two plants were found growing on a small, spirelike peninsula known as 'Ale'ale stack located at Kamohio Bay on the island's south coast at 20°30.79′N, 156°36.30′W.

Habitat. Kanaloa occurs on steep, rocky talus slopes at 45–60 m elevation with a substrate consisting of oxisols derived from basaltic lavas. The area harbors intact mixed native coastal shrubland with *Sida fallax* Walpers, *Senna gaudichaudii* (Hooker & Arnott) H. Irwin & Barneby, *Bidens mauiensis* (A. Gray) Sherff, *Lipochaeta lavarum* (Gaudichaud-Beaupré) DC., and *Portulaca molokiniensis* Hobdy as dominant species. Other associates include *Heteropogon contortus* (L.) P. Beauvois ex Roemer & Schultes, *Chamaesyce celastroides* (Boissier) Croizat & Degener var. *amplectens* (Sherff) Degener & I. Degener, *Capparis sandwichiana* DC., *Waltheria indica* L., *Doryopteris decipiens* (Hooker) J. Smith, *Portulaca villosa* Chamisso, *Ipomoea tuboides* Degener & Ooststroom, *Mariscus phleoides* Nees ex Kunth subsp. *phleoides*, *Eragrostis atropioides* Hillebrand, *Panicum fauriei* Hitchcock var. *latius* (St. John) Davidse, and *P. torridum* Gaudichaud-Beaupré. Some of these native plants are rare Hawaiian endemics, the only alien species being *Emelia fosbergii* Nicolson, *Chloris barbata* (L.) Swartz, and *Nicotiana glauca* R. C. Graham. The area is also a nesting site for Bulwer's petrels and wedge-tailed shearwaters. The fact that 'Ale'ale stack is almost separated from Kaho'olawe by a gap too steep for goats to cross explains the existence of the intact mixed coastal shrubland at this site.

Phenology and reproduction. The plants were observed to be briefly deciduous in October, after which a flush of new leaves was produced and partial expansion of the flower buds occurred. Brief flowering periods, apparently lasting only a few days, took place after heavy rains in November and again

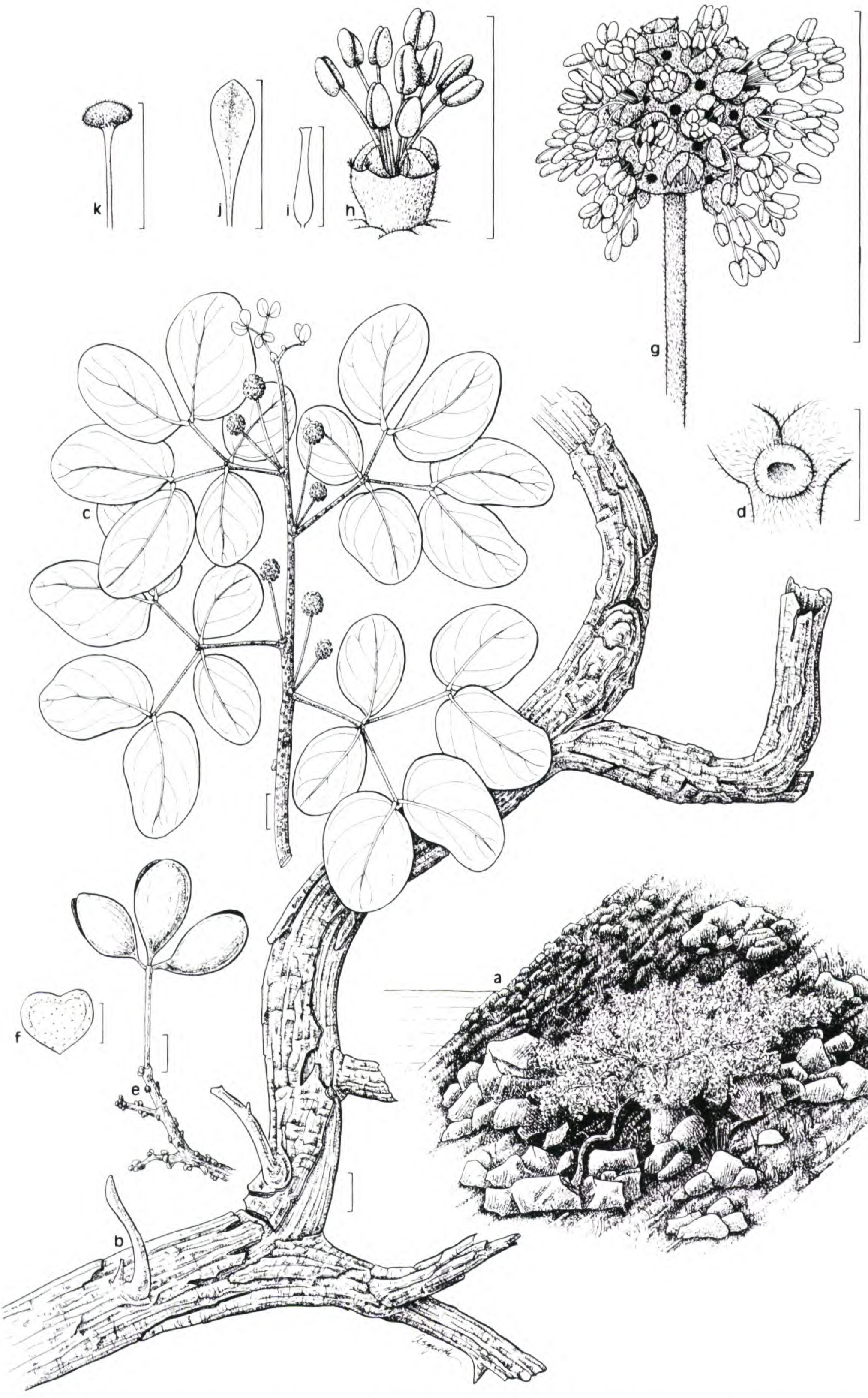

Figure 2. *Kanaloa kahoolawensis* Lorence & K. R. Wood. —a. Habit and habitat. —b. Branch. —c. Flowering twig. —d. Nectary on petiole apex. —e. Infructescence. —f. Seed. —g. Head of staminate flowers at anthesis. —

in April or May. No young plants were observed, although old stems of approximately 12 to 15 dead individuals were seen nearby. No hermaphroditic flowers were found among the numerous capitula examined (mostly fallen dried capitula, plus several fresh ones from cuttings in the HPCC nursery). The paucity of hermaphroditic flowers may account for the plants' low fruit set and fecundity; only four fruits were found on one plant and one old fruit under the other. Environmental conditions or stress appear to influence the proportion of hermaphroditic versus male flowers produced in *Desmanthus* Willdenow (M. Luckow, pers. comm.), and this also may be the case in *Kanaloa*.

Paratypes. HAWAIIAN ISLANDS. **Kaho'olawe:** Makawao District, 'Ale'ale stack, near Pu'u Koa'e, 50° NE aspect, 45–60 m, 17 May 1992, *Wood et al. 1922* (PTBG), 14 July 1992, *Wood & Perlman 2006* (NY, PTBG), 2 Sep. 1992, *Wood 2070* (K, PTBG), 16 Oct. 1992, *Wood & Perlman 2121* (NY, OXF, PTBG), *Wood & Perlman 2122* (PTBG), 14 May 1993, *Lorence et al. 7379* (BH, PTBG), *Lorence et al. 7380* (PTBG).

Nomenclature. The discovery of this new genus was first alluded to in an article by its co-discoverer in June 1992 (Perlman, 1992). Subsequently Yoshioka & Gon (1993) used our name *Kanaloa kahoolawensis* [but without author, Latin diagnosis, citation of a type or other specimens] when referring to the plant in a popular article on Kaho'olawe published in March 1993. Although Yoshioka and Gon obviously did not intend to validly publish the name, its premature and unauthorized use was unfortunate, resulting in publication of a nomen nudum.

Etymology. Kanaloa is the name of a major Hawaiian deity closely associated with Kaho'olawe. According to Hawaiian legend, Kanaloa used the island as a place where he could rest and recoup his energies. Consequently, the island is dedicated to Kanaloa, which was used as an alternate name for Kaho'olawe: "kohe malama malama o Kanaloa," meaning the place or womb for the resuscitation of Kanaloa (Abraham Piianaia, pers. comm., 1992). Kanaloa also means "secure, firm, immovable, established, unconquerable" (Pukui & Elbert, 1986). Such attributes are certainly essential for this plant to have survived despite the severe degradation of the island.

Pollen morphology (contributed by Jerome V. Ward). A pollen sample was obtained from fallen capitula collected in the litter layer beneath one of the plants (*Wood & Perlman 2006*, voucher PTBG). Anthers were removed from flowers, treated with KOH and acetolysis solution, mounted in glycerine jelly (Erdtman, 1960), and examined in light microscopy (LM). For scanning electron microscopy (SEM), pollen residue in alcohol was strewn onto a stub, coated with gold-palladium, and viewed in a Hitachi S570 scanning electron microscope. Samples for transmission electron microscopy (TEM) were prepared using the technique outlined by Skvarla (1966, 1973) except that the pollen was concentrated in SeaPlaque agarose, and after dehydration the material was embedded in Spurr's resin. Thin sections were collected on 200 mesh copper grids, stained with 10% uranyl acetate in 100% methanol and 0.4% aqueous lead citrate, and examined with a Philips 301 transmission electron microscope.

The pollen of *Kanaloa kahoolawensis* (Fig. 3a–h) is spheroidal to subspheroidal, with the polar and equatorial diameter range of 26–41 μm and a mean of 31 μm (n = 30). The grains are tricolporate monads with conspicuous subcircular annulate endoapertures (ora) visible in light microscopy (Figs. 3c, d). The colpi are long with distinct margins, revealing a finely granular membrane. In SEM the surface sculpturing is seen to be comprised of anastomosing muri forming a finely rugulate pattern, with their loose ends extending slightly from the exine surface.

In TEM the exine structure has a tectal and a columellar or interstitium layer of about equal thickness, each comprising about 27% of the total exine. The lower tectal surface also shows a finely rugulate pattern in TEM (Fig. 3h), but the elements are finer than those found on the outer surface. The columellae are intermediate in complexity, being irregular in shape, of varying thickness, and occasionally branched. In some sectional views (Fig. 3h) interstitial muri can be seen to project vertically from the foot layer and merge with the tectal sculpture above. The foot layer comprises about 35% of the exine, while the endexine at equatorial mesocolpium is thinner than any other layer at around 11% of the total thickness. In the lower portion of the foot layer, thin lamellae are visible which intergrade into the upper endexine and become more evident there due to the contrast difference. The lower endexine is irregular over much of the surface. Under the

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h. Staminate flower. —i. Vestigial pistil from staminate flower. —j. Petal. —k. Peltate floral bract. Scales b, c, e, f, g = 1 cm, d = 2 mm, h = 3 mm, i = 1 mm, j, k = 1.5 mm. (Composite drawing based on type, cited specimens, and photos.)

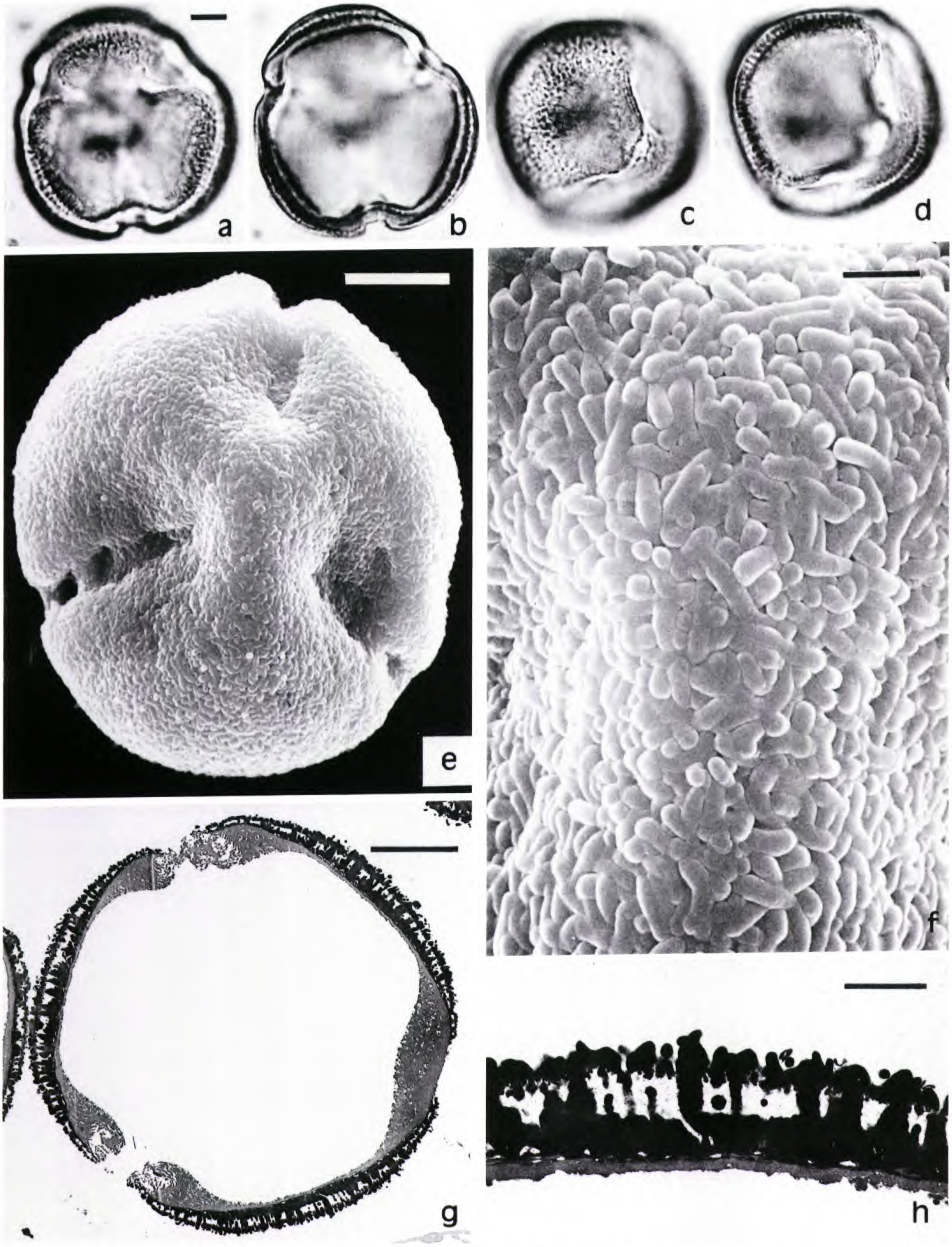

Figure 3. Pollen of *Kanaloa kahoolawensis* Lorence & K. R. Wood in light and electron microscopy. a–d. Light micrographs in high and mid foci. —a, b. Polar view. —c, d. Equatorial view showing prominent os. —e. SEM in polar view. —f. SEM of surface showing detail of finely rugulate sculpture. g, h. TEM, transverse section. —g. Whole grain. —h. Close-up of same section showing exine stratification. Scales a–e, g = 5μm, f, h = 1μm. (From *Wood & Perlman 2006*, PTBG.)

apertures the endexine becomes much thicker and is lamellated, while the foot layer thins.

The pollen of Mimosoideae has been shown to be tectate, predominately occurring in compound units with a granular infratectal structure and porate apertures (Guinet, 1981a, 1981b). The tricolporate single grain is probably the basic or unspecialized type within the subfamily (Guinet, 1981a). Single tricolporate pollen with tectate columellar structure is uncommon within the Mimosoideae but occurs more frequently in certain genera (Guinet, 1981a). This condition is typical of the *Dichrostachys* (DC.) Wight & Arnott group (including *Desmanthus*, *Dichrostachys*, *Gagnebina* Necker ex DC., and *Neptunia* Loureiro), and the *Leucaena* Bentham group (including *Leucaena* and *Schleinitzia* Warburg) sensu Lewis & Elias (1981). Both *Dichrostachys* and *Gagnebina* have mostly compound pollen (tetrads or polyads), although monads with coarsely verrucate sculpture occur in the *Dichrostachys cinerea* (L.) Wight & Arnott group. *Schleinitzia* has large compound grains that are loosely attached (acalymmate), as shown by Nevling & Niezgoda (1978). The remaining three closely related genera, *Desmanthus*, *Neptunia*, and *Leucaena*, show the closest resemblance to the new taxon in pollen morphology. *Neptunia* and *Desmanthus* produce exclusively tricolporate monads, and nearly all species have striate to rugulo-striate sculpture pattern; *Neptunia* has, in addition, annulate endoapertures. Both genera have well-developed columellae, which would be expected, since Guinet (1981a) has shown this character to correlate with the tricolporate condition. Of the approximately 40 species of *Leucaena*, only two (*L. glabrata* Rose and *L. gregii* S. Watson) form tricolporate monads with rugulate to subrugulate sculpture similar to grains of *Kanaloa*.

Remarkably, fossil pollen attributable to *Kanaloa* (Unknown Tricolporate Type 1 of Athens et al., 1992, and Legume Type of Athens & Ward, 1993) was recovered from Quaternary lowland deposits on Maui and O'ahu, which indicates *Kanaloa* once had a more widespread distribution (Jerome Ward, pers. comm., 1994). On O'ahu, pollen data confirm the presence of *Kanaloa* from early Pleistocene to about 800 years B. P., when it was extirpated as a result of human destruction of the lowland forest (Athens et al., 1992; Athens & Ward, 1993).

Chromosome number (contributed by Michael Kiehn). *Kanaloa kahoolawensis* has $2n = 28$ chromosomes. This mitotic number has been established from two different chromosome fixations: a field fixation (*Wood 2070*, voucher PTBG) and a fixation from cuttings of the same collection at the National Tropical Botanical Garden nursery (MK-920902-1/4). The fixations were made in a fresh 3 : 1 mixture of 96% ethanol and glacial acetic acid. After hydrolysis in 5 N HCl for 50 minutes at 20°C, chromosomes were stained using the Feulgen method, as other staining methods (e.g., aceto-carmine or Giemsa) gave only poor results. Counts were carried out on several cells from young flower buds: meristematic cells of developing corolla lobes from very young buds, and cells from young anthers before the first meiotic division. In prometaphase most of the chromosomes measure between 1.4 μm and 2.0 μm, but one pair is longer (ca. 2.4–2.6 μm). All chromosomes are clearly structured and most are metacentric to submetacentric. Besides having prominent centromeres, at least two of the chromosomes of the diploid set seemingly have secondary constrictions, and at least one pair of NOR-chromosomes is present.

A base number of $x = 14$ is indicated for the Mimosoideae (Goldblatt, 1981). In the *Leucaena* group counts of $2n = 36$, 52, 56, and 104 have been published for *Leucaena*, and $2n = 52$ and 54 for *Schleinitzia* (Lewis & Elias, 1981; Geesink et al., 1990). In the *Dichrostachys* group the following numbers have been reported (Lewis & Elias, 1981; Goldblatt, 1981): $2n = 26$ for *Gagnebina*, $2n = 28$ for *Desmanthus*, $2n = 28$, 36, 54, 56, 78 for *Neptunia*, and $2n = 50$, 56 for *Dichrostachys*. Although a count of $2n = 28$ for *Kanaloa* is consistent with base numbers of $x = 14$ for a number of genera in Mimoseae, a comparison of chromosome morphology may further elucidate affinities of *Kanaloa* with other genera.

Wood anatomy (contributed by Regis B. Miller). The wood anatomy description is based on a branch sample (*Wood et al. 1922*, MADw 46696). All features listed in the IAWA Standard List (IAWA Committee, 1989) were examined. Features not specifically mentioned are either absent or not applicable. No main stem heartwood was available, and thus several macroscopic features could not be analyzed. The following description treats only the microscopic features.

Growth rings distinct (separated by marginal bands of parenchyma and the crowding of vessels in the earlywood); diffuse-porous. Vessels in short radial multiples; 85–120 per mm^2; 42–66 μm in tangential diameter; 140–340 μm in element length. Perforation plates simple. Intervessel pits vestured; alternate; circular or oval; 5–6 μm diam.; vessel-ray pitting with distinct borders; similar to intervessel pits in size and shape. Helical thickenings absent. Tyloses infrequent or absent. Fibers septate; thin- to thick-walled; 413–679 μm in length; pits simple to minutely bordered. Vascular or vasicentric tra-

cheids absent. Paratracheal parenchyma vasicentric, aliform, and confluent (confluent parenchyma only occasionally present). Aliform parenchyma winged type. Banded parenchyma in marginal (or seemingly marginal) bands. Axial parenchyma mostly 2–4 cells per parenchyma strand (sometimes fusiform parenchyma cells also present). Rays homocellular, typically procumbent; 4–12 per mm (mostly 9–15); exclusively uniseriate (rarely in part biseriate); 125–233 μm in height. Storied structure not observed. Prismatic crystals abundant and in chambered axial parenchyma (very long chains); one crystal per cell or chamber. Silica absent.

The wood anatomy of *Kanaloa* falls within the range of variability exhibited by *Leucaena* (material of the other genera in the *Leucaena* and *Dichrostachys* groups was not available for comparison). Features similar in both genera include septate fibers, similar sized and shaped intervessel and vessel-ray pits, general parenchyma pattern, and non-storied homocellular rays. The major difference between the two genera is ray width; exclusively uniseriate in *Kanaloa* and multiseriate (generally 2–5 cells) in *Leucaena*. However, most quantitative features such as vessel diameter and frequency, ray height and width, and vessel element and fiber length are smaller, more numerous, or shorter than those of *Leucaena*. These trends may be attributed to habit (*Leucaena* usually a tree vs. *Kanaloa* a shrub), habitat, or the fact that the only sample of *Kanaloa* studied is from a branch.

Affinities. Using the Mimoseae treatment of Lewis & Elias (1981), *Kanaloa* keys out to their *Leucaena* group (which includes *Leucaena* and *Schleinitzia*) or *Dichrostachys* group (which includes *Desmanthus*, *Dichrostachys*, *Gagnebina*, *Neptunia*, and the recently described *Calliandropsis* H. Hernández & Guinet). Nevertheless, *Kanaloa* does not fit readily into genera of either group. Features which *Kanaloa* shares with one or more members of these two groups include: lack of spines or prickles; presence of sessile foliage glands; sepals valvate; petals valvate and free to the base; stamens connate only at base; anthers glabrous and eglandular; pollen grains tricolporate monads; ovary sessile or shortly stipitate; fruit unjointed; and seeds compressed. *Kanaloa* shares the following specialized characters with certain of these genera: inflorescence a head (with *Leucaena*, *Schleinitzia*, and *Desmanthus*); absence of an involucel (with the *Dichrostachys* group); flowers subtended by persistent peltate bracts (with *Desmanthus* and *Leucaena*). Specialized characters unique to *Kanaloa* include its tergeminate leaf formula, large cordiform seeds, and fruits that are small, apparently monospermous, coriaceous, unwinged, and inertly dehiscent along two sutures with the valves separating into inner and outer envelopes.

Members of the *Leucaena* group have heads with persistent peltate floral bracts, apical bisexual flowers, and basal staminate flowers. Although only staminate flowers were observed in available inflorescences of *Kanaloa*, this character may be environmentally induced as fruit development requires at least occasional production of perfect flowers. *Schleinitzia* differs from *Kanaloa* in having anther-glands, acalymmate compound pollen grains, and slightly winged fruit valves that split at the edges but do not separate over the seed-chambers. *Kanaloa* most closely resembles *Leucaena* in lacking anther-glands and having unwinged fruits with valves splitting along both sutures at maturity. However, *Kanaloa* differs from both these genera in lacking an involucel under the capitulum and having unique monospermous fruits and cordiform seeds. Pollen of *Leucaena* is usually compound, but two species have pollen in monads like *Kanaloa*. Although the specialized tergeminate leaf formula of *Kanaloa* is unknown in the *Leucaena* and *Dichrostachys* groups, it has arisen independently in several other mimosoid genera including *Acacia* Miller, *Mimosa* L., and *Calliandra* Bentham, and consequently represents a weak generic character with regard to the subfamily (R. Barneby, pers. comm., 1993).

The *Dichrostachys* group is characterized by: the presence of neuter or nonfunctional staminate flowers with showy staminodia toward the base of the inflorescence (sometimes caducous), a middle zone of staminate flowers, and hermaphroditic flowers toward the apex; free petals and stamens; a subsessile ovary; unjointed fruits; and the absence of a nectary disc. These features all occur in *Kanaloa*, although it differs by the absence of neuter staminodial flowers, extreme rarity or lack of hermaphroditic flowers (may be environmentally induced), and presence of peltate floral bracts. *Dichrostachys* differs from *Kanaloa* in having short shoots with spines or persistent fused stipules, spikes with sterile basal flowers and bisexual terminal ones, and pollen in tetrads or polyads, rarely in monads. *Gagnebina* differs in having elongate upper flowers in bud, basifixed linear anthers, compound pollen grains, and usually winged, indehiscent fruits. *Desmanthus* is distinguished from *Kanaloa* by its subsessile, generally linear fruits with multiple oblique or longitudinal seeds and subulate stipules usually with auricles. *Neptunia* differs from *Kanaloa* by its fruits with usually transverse seeds and ovate to lanceolate, striately nerved stipules. The stipules of *Kanaloa* look most like those found in the monotypic Mexican genus *Calliandropsis*, although the latter has very different floral bracts (M. Luckow, pers.

comm., 1993). Persistent stipule bases also occur in *Desmanthus* and *Dichrostachys* but are structurally quite different from those of *Kanaloa*. *Kanaloa* is set apart from genera in the *Dichrostachys* group by having large rounded buds, capitula with virtually all staminate flowers, peltate floral bracts (present in *Desmanthus*), inertly dehiscent monospermous fruits, and cordiform seeds. Unfortunately, we have not been able to locate hermaphroditic flowers of *Kanaloa* to study the style tip and ascertain whether or not the gynoecium is truly uniovulate—a feature that would be unique in the Mimosoideae—or whether the fruits are monospermous by abortion.

In summary, *Kanaloa* shares certain morphological, wood anatomical, chromosomal, and palynological features with a number of genera in the *Dichrostachys* and *Leucaena* groups, but its unique combination of characters precludes its placement in any known genus. In terms of its chromosome number and pollen structure, *Kanaloa* is most similar to *Desmanthus*, *Neptunia*, and particularly *Leucaena*. Interestingly, Goldblatt (1981) noted a strong correlation between the occurrence of $x = 14$ and the primitive mimosoid condition of monad pollen. Wood anatomy of *Kanaloa* resembles that of *Leucaena* (but comparison to other genera is lacking). DNA studies of *Kanaloa* are currently in progress (Melissa Luckow, pers. comm., 1994), and these may shed more light on the phylogenetic affinities of this fascinating plant.

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Literature Cited

Athens, J. S. & J. V. Ward. 1993. Environmental change and prehistoric Polynesian settlement in Hawai'i. Asian Perspectives 32: 205–223.

———, ——— & S. Wickler. 1992. Late Holocene lowland vegetation, O'ahu, Hawai'i. New Zealand J. Archaeology 14: 9–34.

Erdtman, G. 1960. The acetolysis method. A revised description. Svensk Bot. Tidskr. 54: 561–564.

Geesink, R., W. L. Wagner & D. R. Herbst. 1990. Fabaceae. Pp. 629–721 *in* W. L. Wagner, D. R. Herbst & S. H. Sohmer (editors), Manual of the Flowering Plants of Hawaii, vol. 1. Univ. Hawaii Press and Bishop Museum Press, Honolulu.

Goldblatt, P. 1981. Cytology and the phylogeny of Leguminosae. Pp. 427–463 *in* R. M. Polhill & P. H. Raven (editors), Advances in Legume Systematics, part 2. Royal Botanic Gardens, Kew.

Guinet, Ph. 1981a. Comparative account of pollen characters in the Leguminosae. Pp. 789–799 *in* R. M. Polhill & P. H. Raven (editors), Advances in Legume Systematics, part 2. Royal Botanic Gardens, Kew.

——— 1981b. Mimosoideae: The characters of their pollen grains. Pp. 835–857 *in* R. M. Polhill & P. H. Raven (editors), Advances in Legume Systematics, part 2. Royal Botanic Gardens, Kew.

IAWA Committee. 1989. IAWA list of microscopic features for hardwood identification. IAWA Bulletin, n.s. 10: 219–332.

Kirch, P. V. 1985. Feathered Gods and Fishhooks. Univ. Hawai'i Press, Honolulu, Hawaii.

Lewis, G. P. & T. S. Elias. 1981. Mimoseae. Pp. 155–168 in R. M. Polhill & P. H. Raven (editors), Advances in Legume Systematics, part 1. Royal Botanic Gardens, Kew.

Nevling, L. I. & Ch. J. Niezgoda. 1978. On the genus *Schleinitzia* (Leguminosae–Mimosoideae). Adansonia ser. 2, 18: 345–363.

Perlman, S. 1992. Kahoolawe—The eighth Hawaiian island. Bull. Natl. Trop. Bot. Gard. 22(2): 29–36.

Pukui, M. K. & S. H. Elbert. 1986. Hawaiian Dictionary. Revised and enlarged edition. Univ. Hawaii Press, Honolulu.

Rock, J. F. 1920. The Leguminous Plants of Hawaii. Hawaiian Sugar Planters' Association. Honolulu, Hawaii.

Skvarla, J. J. 1966. Techniques of pollen and spore electron microscopy. Part 1. Staining, dehydration and embedding. Oklahoma Geol. Notes 26: 179–186.

———. 1973. Pollen. Pp. 456–459 *in* P. Gray (editor), Encyclopedia of Microscopy and Microtechnique. Van Nostrand Reinhold, New York.

Wagner, W. L., D. R. Herbst & S. H. Sohmer. 1990. Manual of the Flowering Plants of Hawai'i. 2 vols. Univ. Hawaii Press and Bishop Museum Press, Honolulu.

Yoshioka, J. & S. Gon. 1993. Survey team discovers natural treasures on Kaho'olawe. The Nature Conservancy of Hawaii Newsletter, Winter 1993: 6–7 (March 1993).

Guatteria rupestris (Annonaceae), a New Species from Minas Gerais, Brazil

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ABSTRACT. *Guatteria rupestris* Mello-Silva & Pirani, a new species of Annonaceae, is described. It is distinct because of a combination of several characters, mainly the shrubby, sclerophyllous habit with small, coriaceous, and prominently veined leaves. The new species occurs in open rocky areas in some "serras" of the Espinhaço range, Minas Gerais, Brazil. Besides the description and illustration, comments on its probable taxonomic relationships, habitat, and distribution are presented. A key that distinguishes *G. rupestris* from the other sympatric species of *Guatteria* is also provided.

The genus *Guatteria*, with approximately 250 described species, is the largest of the Annonaceae. Many of the 170-odd species described by Fries were published in 1939. Since his works, relatively few species have been described (Barringer, 1984; Bisse, 1975; Johnson & Murray, 1990; Maas et al., 1988; Mello-Silva & Pirani, 1988). While performing floristic surveys of the Annonaceae of the Espinhaço range, in the states of Minas Gerais and Bahia, Brazil, two new species were found: *G. notabilis* Mello-Silva & Pirani (1988) and *G. rupestris*, here presented.

Guatteria rupestris Mello-Silva & Pirani, sp. nov. TYPE: Brazil. Minas Gerais: Itacambira, ca. de 2 km da cidade na estrada para Juramento, afloramento rochoso no campo rupestre, 17°S, 43°50'W, 14 Dec. 1989, *J. R. Pirani, P. T. Sano, A. Freire-Fierro & T. R. S. Silva CFCR 12752* (holotype, SPF—3 sheets; isotypes, K, MBM, MO, NY, RB, U). Figure 1.

Frutex vel arbor parva, circa 1.5–4 m alt. Rami adscendentes aut patentes, ramuli ochracei-hirtelli vel tomentosi vel glabri. Folia breviter petiolata, lamina coriacea, venosa, elliptica vel oblongo-elliptica vel obovato-elliptica, 3.5–8(–12) cm longa, (1.5–)2–3(–4) cm lata, ad apicem rotundata vel retusa vel breviter acuminata, ad marginem revoluta, glabra vel subtus ad nervum medium dense hirtella; venatio brochidodroma. Inflorescentiae axillares, uniflorae. Sepala libera, deltata, circa 4 mm longa, 3 mm lata; petala aequalia, oblonga vel oblongo-spathulata, ad apicem rotundata vel obtusa, 8–15 mm longa, 5–10 mm lata; stamina numerosa, circa 1.8 mm longa, disco connectivi plano haud umbonato, aurantiaco; carpellis circa 2 mm longis. Monocarpia 10–17, teretes-ellipsoidea, 7–10 mm longa, 3.5–5 mm crassa, stipite 2–7 mm longo suffulta.

Shrub to small tree, 1.5–4 m tall. Twigs ascending or spreading, blackish, brownish or grayish, somewhat wrinkled to reticulate, the younger ones ochraceous-hirsutulous or tomentose or glabrous; internodes 5–20 mm long. Petiole incrassate, 1.5–4 mm long, ca. 1.5–2 mm diam., flat to somewhat canaliculate above, blackish, ochraceous-hirsutulous to glabrous, as the twigs. Leaf blade elliptic to oblong-elliptic or obovate-elliptic, rarely oblong, 3.5–8 (–12) cm long, (1.5–)2–3(–4) cm wide, coriaceous, in vivo light green with primary vein initially greenish red and, later, ochre-colored below, glabrous above, sparsely hirsutulous to glabrous below, base attenuate to decurrent on the petiole, apex rounded and often retuse or short-acuminate, margins revolute mostly toward base; primary vein flat above, prominent and densely hirsutulous below, venation brochidodromous or rarely eucamptodromous, secondary veins straight (to slightly curved), 8–11 (–16) per side, ascending at 70° from perpendicular, loop-forming at acute to right angles, loops mostly distinct, enclosed by secondary arches, distance between loop and margin 2–3(–4) mm, tertiary veins reticulate, secondary and tertiary venation prominent on both sides. Inflorescences axillary, within (or just below) foliate zone, single-flowered. Peduncle 1(–2.5) mm long, 1.5–2 mm diam., tomentose or glabrous; bracts 3, soon deciduous, pellucid-dotted, the proximal one ca. 3 mm long, 1.5 mm wide. Pedicel ca. 3(–6) mm long, 1.5–2 mm diam., hirsutulous or glabrous, as the twigs. Flowers in vivo light green with ochraceous indument. Sepals triangular, 4 mm long, 3 mm wide, acute, tomentose on the abaxial side, glabrous on the adaxial side. Petals oblong to oblong-spatulate, rounded to obtuse at apex, 8–15 mm long, 5–10 mm wide, pubescent on both sides but glabrous in the lower part on the adaxial side. Stamens numerous, ca. 1.8 mm long, apex of connective flat, not umbonate, orange, anthers extrorse, outer thecae longer than the inner

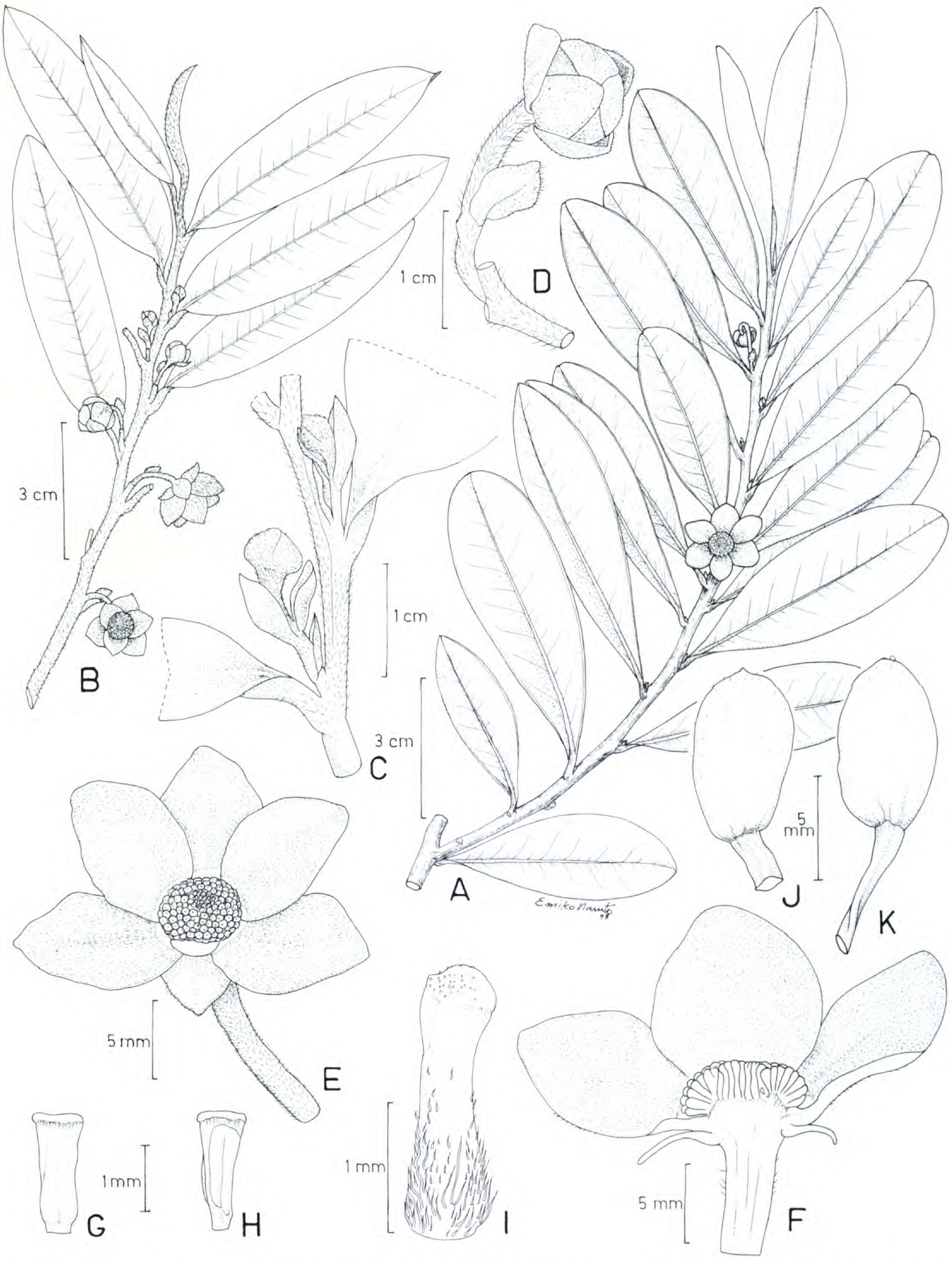

Figure 1. *Guatteria rupestris* Mello-Silva & Pirani. —A, B. Flowering shoots. —C. Branchlet with two inflorescences, each with three bracts. —D. Inflorescence before anthesis. —E. Flower at anthesis, one petal removed. —F. Longitudinal section of flower. —G, H. Stamens, adaxial and lateral views. —I. Carpel. —J, K. Monocarps. A, drawn from *Pirani et al. CFCR 12522;* B–D, drawn from *Joly et al. CFSC 359;* E–I, drawn from *Freire-Fierro & Esteves 1611;* J, drawn from *Mello-Silva & Cordeiro CFCR 10108;* K, drawn from *Mello-Silva et al. CFCR 5419.*

ones, extending almost to the base of the stamen. Carpels light green to grayish green, ca. 2 mm long, ovary minutely setose mainly at angles, style glabrous, stigma papillose. Monocarps 10–17, oblong-ellipsoid, 7–10 mm long, 3.5–5 mm diam., shortly apiculate, sparsely puberulent to glabrous, stipe 2–7 mm long, sometimes apparently articulated when dried, green when immature, purplish red at maturity, black when dried, seed filling up the entire cavity, seed-coat rugulose, chestnut-brown.

Guatteria rupestris is distinct from other species of *Guatteria* because of the following combination of characters: small, coriaceous, short-petiolate, mainly elliptic to oblong-elliptic leaves with rounded to retuse to short-acuminate apices and revolute margins, with very prominent secondary and tertiary veins on both sides; solitary flowers with equal petals; carpels with glabrous styles; monocarps 10–17 with a short stipe (2–7 mm long).

Guatteria rupestris is endemic to the southern portion of the Espinhaço range (Fig. 2). It is a shrub or small tree up to 3 m that grows in open vegetation among sandstone rocks; it grows in gallery forests as well, and there the plants tend to be larger. It occurs at Grão-Mogol, Itacambira, Serra do Ambrósio, and Serra do Cipó, all in the State of Minas Gerais.

Guatteria is originally a forest genus; the species that live in open and dry areas are rare (Morawetz, 1986). Two species from the Espinhaço range, *G. odontopetala* Martius and *G. villosissima* A. Saint-Hilaire occur exclusively in forests. Two other species, *G. pohliana* Schlechtendal ex Martius and *G. sellowiana* Schlechtendal, occur mostly in forests but have occasional "campo" populations. The populations of *G. notabilis* are found on "campo" as much as in forests. *Guatteria rupestris* tends to colonize open areas; the majority of the populations that have been found so far grow on these types of places. The following key distinguishes *G. rupestris* from the other sympatric species of *Guatteria* mentioned above.

KEY TO *GUATTERIA RUPESTRIS* AND SYMPATRIC SPECIES OF *GUATTERIA*

1a. Flowers terminal, monocarps sessile ..... *Guatteria notabilis*
1b. Flowers axillary, monocarps stipitate.
  2a. Adaxial side of the leaf blades glabrous, even in the young ones.
    3a. Leaf coriaceous, apex rounded to abruptly short-acuminate, sometimes emarginate; "campo" shrub or forest treelet ..... *G. rupestris*
    3b. Leaf chartaceous, apex acuminate to long-acuminate; forest tree, very rarely "campo" shrub ..... *G. pohliana*
  2b. Adaxial side of the leaf blades, at least in the young ones, hairy all over or only on the primary vein.
    4a. Twigs persistently and densely ferrugineo-velutinous; adaxial side of the young leaf blades glabrous, except for the velutinous primary vein; most adult leaf blades strongly revolute ..... *G. villosissima*
    4b. Twigs short-tomentose to sparsely villosulous to glabrous; adaxial side of the young leaf blades tomentose or villosulous; adult leaf blades flat or slightly revolute at base.
      5a. Petals with acute to obtuse apex; inflorescences in foliate zone; leaf blades acute at base, adaxial side of the young ones tomentose ..... *G. sellowiana*
      5b. Petals with truncate and crenulate apex; inflorescences mostly below foliate zone; leaf blades obtuse to rounded at base, adaxial side of the young ones adpressed-villosulous ..... *G. odontopetala*

Guatteria rupestris is more frequent at the Serra de Grão-Mogol where, as at the Serra do Cipó, forest populations are found. At Serra do Cipó, one campo collection (*Joly et al. CFSC 359*), though showing the characters typical of the species, exhibits narrowly oblong leaves. This character distinguishes it from all the other collections because the leaves in *G. rupestris*, though variable, tend to maintain a basically elliptical configuration (Fig. 2).

Guatteria rupestris and *G. notabilis* do not seem to be closely related to any taxa from southeastern Brazil. At present, it is impossible to ascribe the new species to any of the extant sections of the genus, although it exhibits some leaf similarities (e.g., leaf size, shape, venation, texture) with species of section *Sclerophyllum* R. E. Fries from northern and northwestern portions of South America.

Paratypes. BRAZIL. **Minas Gerais:** Grão-Mogol, arredores, em mata da borda da chapada, 24 July 1978 (fl), *G. Hatschbach 41573* (MBM); Grão-Mogol, campos rupestres atrás da cidade, 13 Apr. 1981 (fl), *I. Cordeiro, J. R. Pirani, L. Rossi, A. Furlan & M. C. E. Amaral CFCR 788* (MG, SPF); Grão-Mogol, campo rupestre em direção nordeste da cidade, 16°32'S, 42°55'W, elev. 3,500 pés, 22 May 1982 (fl), *N. Hensold, M. C. H. Mamede, A. M. & N. Giulietti CFCR 3450* (CEPEC, R, SPF, U); Grão-Mogol, beira do Córrego das Mortes, 28 Feb. 1983 (fl, fr), *I. Cordeiro & E. Simonis CFCR 4116* (F, SPF, U not seen); Grão-Mogol, vale do Ribeirão das Mortes, acima da cidade, elev. 910 m, carrascal, 4 Sep. 1986 (fr), *R. Mello-Silva & I. Cordeiro CFCR 10108* (G, SPF, UEC); Grão-Mogol, vale do Ribeirão das Mortes, elev. 900 m, 23 May 1987 (fl), *R. Mello-Silva & J. R. Pirani CFCR 10812* (BHCB, CTES, HUEFS, SPF); Grão-Mogol, Trilha da Tropa, no alto da serra, elev. ca. 1,000–

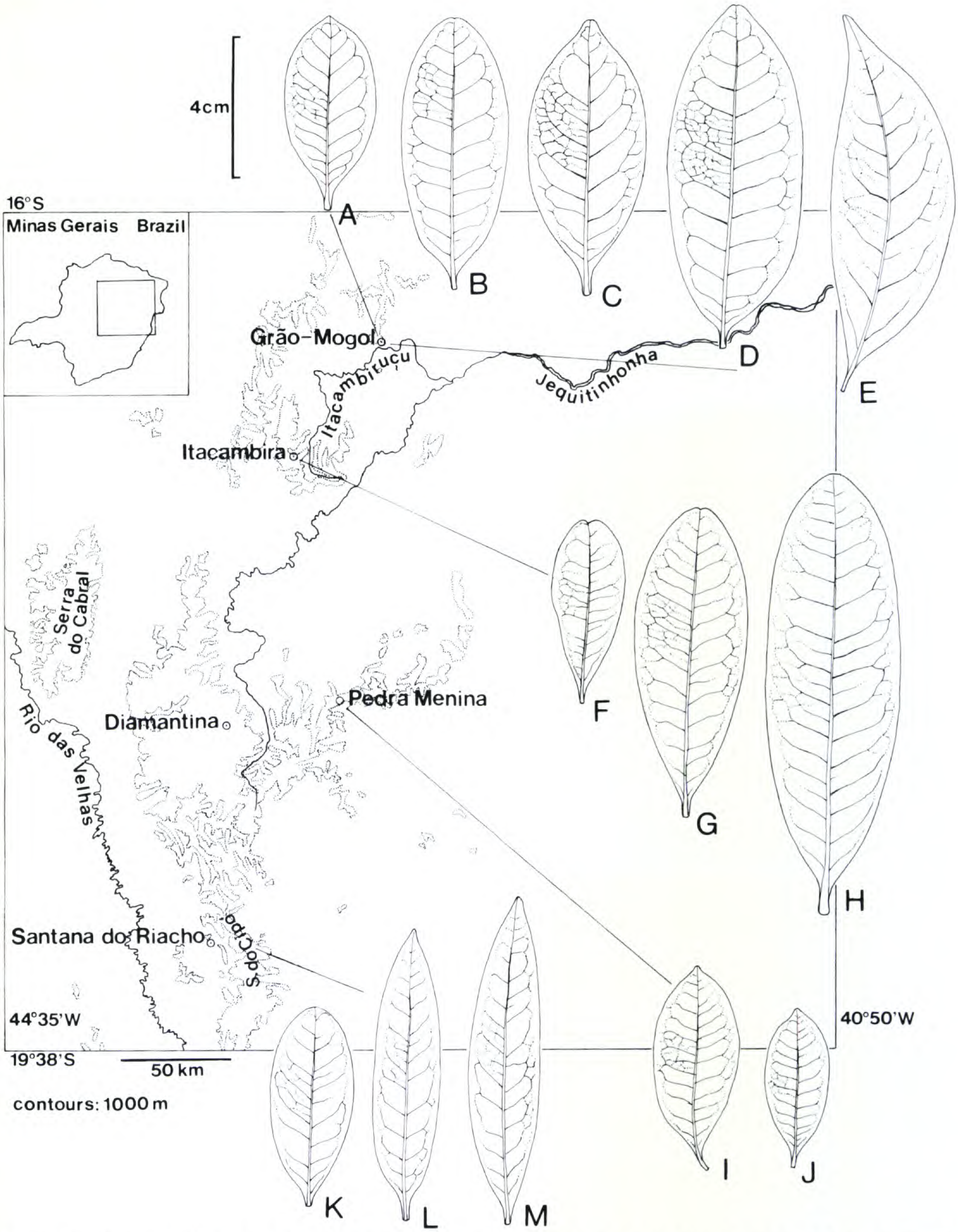

Figure 2. Espinhaço Range in Minas Gerais, Brazil, depicting variation of leaf shape along the different areas of occurrence of *Guatteria rupestris*. A, *Hensold et al. CFCR 3450*; B–D, *Cordeiro & Simonis CFCR 4116*; E, *Cordeiro et al. CFCR 788*; F–H, *Pirani et al. CFCR 12752* (holotype); I, J, *Mello-Silva et al. CFCR 5419*; K, *Freire-Fierro & Esteves 1611*; L, M, *Joly et al. CFSC 359*.

1,200 m, no interior de mata ciliar, 11 Dec. 1989 (fl), *J. R. Pirani, P. T. Sano, T. R. S. Silva & A. Freire-Fierro CFCR 12522* (SP, SPF, UB); Grão-Mogol, estreito do riacho Ribeirão, elev. ca. 950 m, 16°33′S, 42°54′W, 6 Sep. 1990 (fl, fr), *J. R. Pirani, G. L. Esteves, M. T. V. A. Campos & T. R. S. Silva CFCR 13422* (IPA, SPF); Rio Vermelho, Pedra Menina, fazenda Vargem do Anjo, morro Espigão do Meio, 13 Oct. 1984 (fr), *R. Mello-Silva, M. Meguro, E. M. Isejima & J. R. Pirani CFCR 5419* (K, RB, SPF, US); Santana do Riacho, Serra do Cipó, km 137–138 da rodovia Lagoa Santa–Conceição do Mato Dentro, elev. 1,240 m, 8 June 1970 (fl), *A. B. Joly, J. Semir & Y. Ugadim CFSC 359* (SP, SPF, UEC); Santana do Riacho, Serra do Cipó, km 130 da rodovia Lagoa Santa–Conceição do Mato Dentro, ca. de 500 m da bifurcação na estrada para Morro do Pilar, em mata ciliar a 200 m da estrada, 11 Aug. 1990 (fl), *A. Freire-Fierro & G. L. Esteves 1611* (BHCB, MBM, SP, SPF).

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Literature Cited

Barringer, K. 1984. A new species of *Guatteria* (Annonaceae) from Panama. Ann. Missouri Bot. Gard. 71: 1186–1187.

Bisse, J. 1975. Nuevos arboles de la flora de Cuba. Ciencias (Cuba), ser. 10, Bot. 2: 3–6.

Fries, R. E. 1939. Revision der Arten einiger Anonaceen–Gattungen V. Acta Horti Berg. 12(3): 289–577, pl. 1–40.

Johnson, D. M. & N. A. Murray. 1990. New species of *Guatteria* (Annonaceae) from the Guayana Highland. Ann. Missouri Bot. Gard. 77: 598–600.

Maas, P. J. M., E. C. H. van Heusden, J. Koek-Noorman, A. K. van Setten & L. Y. Th. Westra. 1988. Studies in Annonaceae. IX. New species from the Neotropics and miscellaneous notes. Proc. Kon. Nederl. Akad. Wetensch., Ser. C, 91: 243–282.

Mello-Silva, R. de & J. R. Pirani. 1988. *Guatteria notabilis* Mello-Silva & Pirani, nova espécie de Annonaceae da Cadeia do Espinhaço, Brasil. Bol. Bot. (São Paulo) 10: 43–50.

Morawetz, W. 1986. Systematics and Karyoevolution in Magnoliidae: *Tetrameranthus* as compared with other Annonaceae genera of the same chromosome number. Pl. Syst. Evol. 154: 157–173, figs. 1–7.

New Combinations in *Urceola* (Apocynaceae)

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ABSTRACT. Seven new combinations in *Urceola*, *U. xylinabariopsoides*, *U. huaitingii*, *U. micrantha*, *U. quintaretii*, *U. tournieri*, *U. rosea*, and *U. linearicarpa*, are proposed.

In a forthcoming paper in *Kew Bulletin*, the relationships between *Urceola* Roxburgh, *Ecdysanthera* Hooker & Arnott, *Parabarium* Pierre ex Spire, *Xylinabaria* Pierre, and *Xylinabariopsis* Pitard will be discussed, and the conclusion reached that these genera are not distinguishable (Middleton, in press). A revision of *Urceola* in Thailand, with the generic name *Urceola* taking priority, will be presented.

The problem now arises that there are no combinations in *Urceola* for those species of *Ecdysanthera* that are to appear in the account of the Apocynaceae for the *Flora of China*. This paper seeks to rectify this situation until such a time as the entire genus can be satisfactorily revised.

Urceola xylinabariopsoides (Tsiang) D. J. Middleton, comb. nov. Basionym: *Chunechites xylinabariopsoides* Tsiang, Sunyatsenia 3: 306. 1937. TYPE: China. Hainan: Lok-tung, 9 June 1936, *S. K. Lau 27035* (holotype, SYS).

Urceola huaitingii (Chun & Tsiang) D. J. Middleton, comb. nov. Basionym: *Parabarium huaitingii* Chun & Tsiang, J. Arnold Arbor. 28: 245. 1947. TYPE: China. Guangxi (as Kwangsi): Shih-Wan-Ta Shan, Hsiang-Tze, 30 Apr. 1944, *S. H. Chun 5027* (holotype, SYS).

Urceola micrantha (Wallich ex G. Don) D. J. Middleton, comb. nov. Basionym: *Echites micrantha* Wallich ex G. Don, Gen. Hist. 4: 75. 1837. TYPE: India. Pundua, *Wallich 1667* (lectotype, selected by Lý (1978), CGE).

Urceola quintaretii (Pierre) D. J. Middleton, comb. nov. Basionym: *Ecdysanthera quintaretii* Pierre, Rev. Cult. Colon. 11: 228. 1902. TYPE: Laos. Camon, *Tournier? 6618* (lectotype, selected by Lý (1978), P).

Urceola tournieri (Pierre) D. J. Middleton, comb. nov. Basionym: *Ecdysanthera tournieri* Pierre, Rev. Cult. Colon. 11: 228. 1902. TYPE: N Laos. Tran-ninh, *Tournier 6613* (lectotype, selected here, P).

Urceola rosea (Hooker & Arnott) D. J. Middleton, comb. nov. Basionym: *Ecdysanthera rosea* Hooker & Arnott, Bot. Beechy Voy. 198. 1836. TYPE: China. *Vachel 144* (lectotype, selected here, K).

Urceola linearicarpa (Pierre) D. J. Middleton, comb. nov. Basionym: *Ecdysanthera linearicarpa* Pierre, Rev. Cult. Colon. 11: 228. 1902. TYPE: N Laos. Tran-ninh, *Tournier 6615* (lectotype, selected by Lý (1978), P).

Acknowledgment. I am grateful to Ihsan Al-Shehbaz for his help in preparing this paper.

Literature Cited

Lý, T. D. 1978. Beiträge zur Kenntnis der Sippenstruktur des Genus Parabarium Pierre ex Spire (Apocynaceae). Feddes Repert. 89: 205–292.

Middleton, D. A revision of *Urceola* (Apocynaceae) in Thailand. Kew Bull. 49(4) (in press).

Three New Combinations in Chinese Apocynaceae

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ABSTRACT. Two new combinations in *Ichnocarpus* and one new combination in *Anodendron* are proposed.

In a revision of the Australian and New Guinean species of *Ichnocarpus*, Forster (1992) concluded that *Micrechites* was not sufficiently distinct to be maintained as a separate genus. My own work supports this conclusion. New combinations are now needed to reflect this change in the status of *Micrechites* for the forthcoming account of the Apocynaceae in the *Flora of China*. One species of *Micrechites* was found to be an *Anodendron* on examination.

Ichnocarpus jacquetii (Pierre ex Spire) D. J. Middleton, comb. nov. Basionym: *Micrechites jacquetii* Pierre ex Spire, Contr. Apocyn. 48. 1905. TYPE: Laos, *Spire 5* (lectotype, designated here, P; isolectotype, K).

Ichnocarpus malipoensis (Tsiang & P. T. Li) D. J. Middleton, comb. nov. Basionym: *Micrechites malipoensis* Tsiang & P. T. Li, Acta Phytotax. Sin. 11: 381. 1973. TYPE: China. Yunnan: Ma-Li-Po, Tung-Ting, *Feng 13377* (holotype, PE not seen; isotype, A).

Anodendron formicina (Tsiang & P. T. Li) D. J. Middleton, comb. nov. Basionym: *Micrechites formicina* Tsiang & P. T. Li, Acta. Phytotax. Sin. 11: 385. 1973. TYPE: China. Yunnan: Si-Shuang-Pan-Na, *C. W. Wang 73452* (holotype, PE; isotypes, A, IBSC).

Acknowledgment. I thank Ihsan Al-Shehbaz for help with the publication of this paper.

Literature Cited

Forster, P. I. 1992. A taxonomic revision of *Ichnocarpus* (Apocynaceae) in Australia and Papuasia. Austral. Syst. Bot. 5: 533–545.

New Infrageneric Taxa of *Corispermum* L. (Chenopodiaceae)

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ABSTRACT. Two new infrageneric taxa of *Corispermum* L. (Chenopodiaceae) are described: sections *Patellisperma* and *Declinata*. Geographical distributions and taxonomic comments are provided.

Corispermum L. (Chenopodiaceae, Corispermeae) is a relatively compact and clearly defined genus consisting of ca. 60 almost obligately psammophytic species distributed primarily in the arid regions of Asia, with some species also native to temperate Europe, northern Asia, and North America. Unfortunately, with the exception of three series described by Klokov (1960) in his monograph of some East European species, no infrageneric system has been proposed for this genus.

The present paper may be regarded as the preliminary outline of the infrageneric classification of *Corispermum* (at the sectional level), since the proper placement of many insufficiently known species (e.g., sometimes represented in herbaria only by type collections) is not completely clear and remains a task for further study. It is especially true for Central and East Asian species (see Iljin, 1929; Tsien Chopo & Ma Cheng-gung, 1979).

Corispermum sect. **Patellisperma** Mosyakin, sect. nov. TYPE: *C. patelliforme* Iljin.

Fructus rotundati vel subrotundati, apteri, erostrati. Perianthium triphyllum. Folia lata; oblongo-elliptica, oblongo-obovata, oblanceolata vel elliptica.

Fruit (achene) patelliform (saucer-shaped), rotundate or almost rotundate in outline, wingless, without distinct apical beak (remains of style bases). Leaves comparatively broad, from almost obovate to oblanceolate.

Species. This is a monotypic section consisting only of the species *Corispermum patelliforme* Iljin.

Distribution. Arid regions of Central Asia (western China, Mongolia).

This section seems to be the most primitive one within the genus. *Corispermum patelliforme* has some archaic characters, such as comparatively broad leaves with 3–5 veins (in most of the other representatives of *Corispermum* the leaves are 1-veined, rarely 3-veined, and more narrow), leaflike bracts, wingless patelliform, almost round in outline fruit without protruding style bases, and nonreduced perianth segments. It seems to be quite close to the hypothetical ancestor of the genera *Corispermum* and *Anthochlamys* Fenzl.

Corispermum sect. **Declinata** Mosyakin, sect. nov. TYPE: *C. declinatum* Stephan ex Iljin.

Fructus elongati; glabri vel stellato pilosi, apteri vel alati; apice rotundati vel saepissime rostrati, basi stylorum apiculati vel subtruncati. Perianthium plerumque monophyllum.

Fruits elongate, at least 2 (1.5) times as long as wide; glabrous or covered with branched (sometimes almost stellate) hairs; winged or wingless at margin; in most cases with triangular apex protruding toward bases of styles, sometimes rotundate. Perianth segment 1.

Species. This section consists of at least two species: *Corispermum declinatum* Stephan ex Iljin and *C. tylocarpum* Hance sensu lato (including *C. rostratum* Baranov & B. Skvortsov and *C. gmelinii* Bunge).

Distribution. Arid regions of Asia (southern Siberia, Mongolia, China, Kazakhstan); also adventive in eastern Europe (*C. declinatum*).

This deviate section possibly is closely related to some Asian species of *Corispermum* sect. *Corispermum*, namely *C. sibiricum* Iljin and *C. candelabrum* Iljin. Some other Chinese species of *Corispermum* (*C. macrocarpum* Bunge ex Maximovicz, *C. stenolepis* Kitagawa, *C. platypterum* Kitagawa, and *C. huanghoense* Tsien & C. G. Ma) also have an elongate fruit body, and seem to be related to the section *Declinata*. However, their fruits are broadly winged and often emarginate at the apex. After additional investigation these species may possibly be separated into a section or subsection of their own.

Corispermum declinatum has been constantly erroneously cited as "*C. declinatum* Stephan ex Steven." However, Steven (1817) never accepted *C. declinatum:* he cited it as a synonym of *C. hyssopifolium* var. *a*. The first valid publication of the name appeared in Iljin (1928). Thus, the combination *C. declinatum* var. *tylocarpum* (Hance)

Tsien & C. G. Ma (1979) is invalid, because *C. declinatum* was described later than *C. tylocarpum*.

Corispermum sect. **Corispermum.** TYPE: *C. hyssopifolium* L. (lectotype of the genus).

This section should be divided into at least seven subsections. However, the description of these subsections should be accompanied by a detailed analysis of taxonomic relationships at the species level. The genus is currently under revision, and new subsections will be validated in the forthcoming treatments for European and North American taxa.

Acknowledgments. I thank Bruce D. Parfitt and Amy Scheuler McPherson for helpful comments and discussion. This article was prepared during my recent visit to the Missouri Botanical Garden, and I am grateful to the staff for their hospitality.

Literature Cited

Iljin, M. M. 1928. *Corispermum declinatum* Steph., kak novyy sornyak v posevakh Evropeyskoy chasti SSSR (*Corispermum declinatum* as a new weed in the European part of the USSR). Trudy Prikl. Bot. Genet. Selekts. (Leningrad) 19(2): 69–72.

———. 1929. Novye vidy roda *Corispermum* L. (Corispermi generis species novae). Izv. Glavn. Bot. Sada SSSR 28: 638–654.

Klokov, M. V. 1960. O dneprovskikh i nekotorykh drugikh vidakh roda *Corispermum* L. (De Corispermis Borysthenicis necnon aliis nonnulis.) Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 20: 90–136.

Steven, C. 1817. Observationes in Plantas Rossicas et descriptiones specierum novarum. Mem. Soc. Imp. Naturalistes Moscou 5: 334–338.

Tsien Cho-po & Ma Cheng-gung. 1979. *Corispermum* L. Pp. 50–75 *in* Flora Reipublicae Popularis Sinicae. Tomus 25(2). Beijing.

Especies Nuevas de Meliaceae del Ecuador y Areas Adyacentes

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RESUMEN. Seis especies nuevas de Meliaceae son descritas: *Trichilia primogenita*, *T. obovata*, *Guarea riparia*, *G. ecuadoriensis*, *Ruagea membranacea*, y *R. microphylla*. La primer especie pertenece al noroccidente del Ecuador en el borde con Colombia y las cinco restantes a las áreas limítrofes entre Ecuador, Perú, y Colombia en la parte más occidental de la Amazonía. Caracteres excepcionales o la combinación de varios caracteres, determinan que las especies descritas sean distintas de las especies conocidas.

ABSTRACT. Six new species of Meliaceae are described: *Trichilia primogenita*, *T. obovata*, *Guarea riparia*, *G. ecuadoriensis*, *Ruagea membranacea*, and *R. microphylla*. The first species occurs in northwestern Ecuador, near the Colombian border, and the five remaining species are from extreme western Amazonia, in the border region between Ecuador, Peru, and Colombia. Exceptional characters or combinations of characters distinguish the new taxa from known species of Meliaceae.

En los últimos años los estudios florísticos en el Ecuador han alcanzado un significativo avance. El Herbario Nacional del Ecuador (QCNE) y el Jardín Botánico de Missouri (MO), con la participación de la Fundación Jatun Sacha, están desarrollando una serie de investigaciones botánicas en vastas zonas del país. Las áreas con mayor énfasis visitadas han sido la Región Amazónica bajo los 1,000 m y el noroccidente ecuatoriano. Miles de colecciones de plantas han permitido el mejor conocimiento de la flora y el descubrimiento para la ciencia de nuevas especies.

Trichilia primogenita W. Palacios, sp. nov. TIPO: Ecuador. Esmeraldas: carretera Lita–San Lorenzo, 19 mayo 1987 (fl), *van der Werff, Dodson & Palacios 9502* (holótipo, QCNE; isótipos, AAU, K, MO). Figura 1.

Trichiliae poeppigii C. DC. affinis sed petiolo subtereti, foliolis obovatis, marginibus acutis nervis secundariis prominentibus, petalis liberis papillosis differt.

Arbol mediano hasta 15 m de altura. Ramas jóvenes densamente lenticeladas. Yemas jóvenes densamente estrigulosas a subglabras. Hojas de 40–70 cm de largo, imparipinnadas o paripinnadas y, en este caso, con el último folíolo simulando ser terminal; pecíolo semiterete, glabro; raquis semiterete, glabro; peciólulos de los folíolos laterales 4–8 mm de largo, engrosados; peciólulo del folíolo terminal 3–4 cm de largo con el ápice ligeramente engrosado. Folíolos 5–7(–8), alternos, 16–30 cm de largo y 8–13 cm de ancho, obovados o elípticos a ligeramente oblanceolados, coriáceos; ápice agudo a abruptamente corto acuminado, base angosta, aguda; haz y envés glabros. Nervación eucamptódroma-broquidódroma, 10–16 nervios secundarios a cada lado del nervio principal. Inflorescencia axilar o naciendo en las axilas de hojas caídas, panícula o tirso, profusamente florida, 8–30 cm de largo; ramificiones de la inflorescencia hasta 10 cm de largo o más. Flores unisexuales (vistas ♂). Cáliz pateliforme-rotado, 0.8–1 mm de largo, (3–)4–5 lóbulos cortos o ligeramente sinuados con pelos dispersos. Pétalos 4–5, 2.6–3.4(–4) mm de largo y 1.2–2 mm de ancho, erectos, largamente ovados o ligeramente lanceolados, valvados, libres o unidos solamente en la base, glabros, papilosos. Tubo estaminal cilíndrico-urceolado, 1.9–2.3 mm, con pelos o barbas dispersos por dentro; filamentos completamente fusionados, desiguales; 8–9 anteras alternando con lóbulos subulados, las anteras ubicadas a diferente altura en el ápice del tubo. Ovario 3-locular, pubescente, (1–)2 óvulos por lóculo, colaterales, estilo corto, estigma capitado, glabro. Fruto no conocido.

La distribución de *T. primogenita*, se conoce sólo de la colección tipo. De acuerdo a la clasificación de Holdridge (1987), el área está ubicada aproximadamente en la transición entre el Bosque Muy Húmedo Tropical y el Bosque Pluvial Premontano. No existen datos meteorológicos de la zona, pero se cree que llueve más de 5,000 mm por año. El suelo donde fue colectada la especie está formado por una ligera capa de humus de 15–20 cm de profundidad, seguida por una capa arcillosa de color gris claro a blanco, al parecer del tipo caolinita.

Trichilia primogenita está relacionada a *T. poeppigii* C. DC. de la que difiere por el pecíolo semiterete (pecíolo semiterete-alado en la mitad basal, luego terete, usualmente con dos cicatrices o dos

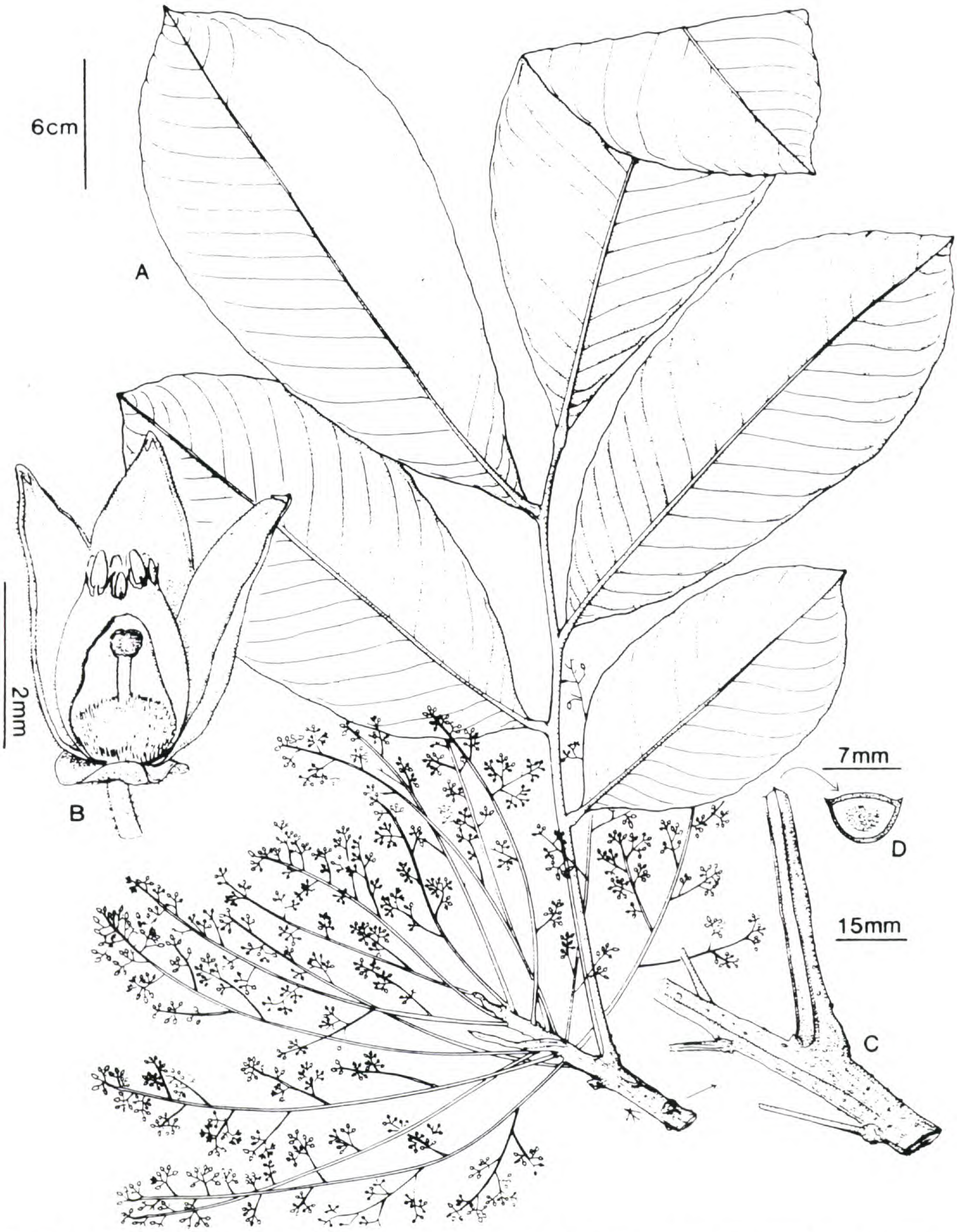

Figura 1. *Trichilia primogenita* W. Palacios. —A. Hábito. —B. Flor abierta. —C. Base del pecíolo. —D. Sección transversal del pecíolo. (A–C, *van der Werff et al. 9502.*)

folíolos? reducidos menores a 0.5 mm de largo en el punto donde terminan las estrechas alas en *T. poeppigii*), folíolos obovados, coriáceos (folíolos oblanceolados, subcoriáceos en *Trichilia poeppigii*), nervios secundarios prominentes-filudos, curvados cerca del margen y formando arcos en el ápice de la lámina (nervios secundarios prominulentos, sin formar arcos en *T. poeppigii*), y por las

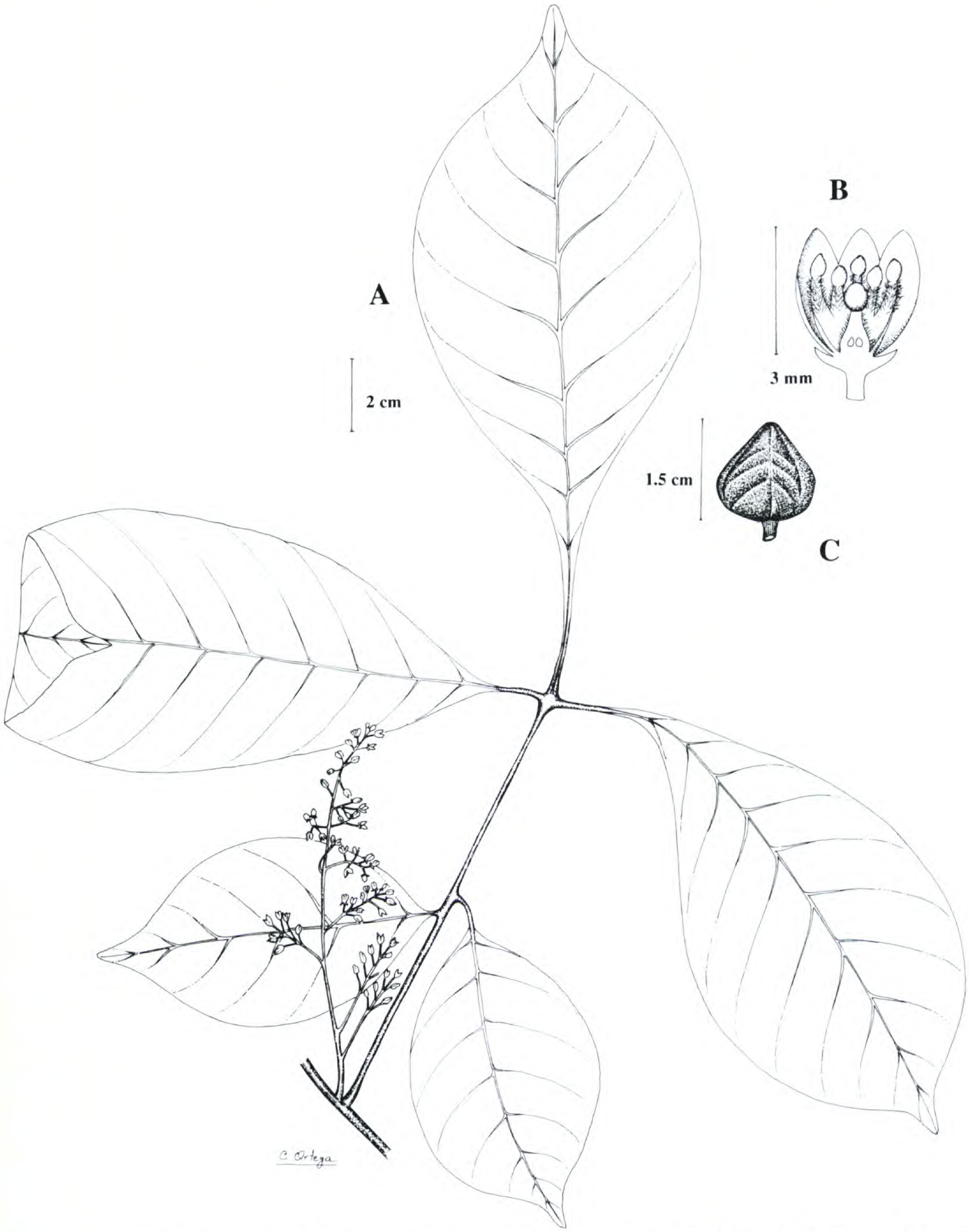

Figura 2. *Trichilia obovata* W. Palacios. —A. Hábito. —B. Flor abierta. —C. Fruto. (A–B, *Daniel Rubio & Coba 855*; C, *Neill et al. 6310.*)

flores bien sincronizadas en su estado de desarrollo, con pétalos totalmente libres y glabros (flores en todos los estados de desarrollo, con pétalos soldados en ½–¾ de su longitud, densamente estrigulosos en *T. poeppigii*). En ausencia del fruto no es posible establecer otras relaciones.

Trichilia obovata W. Palacios, sp. nov. TIPO: Ecuador. Pastaza: Pozo Petrolero Danta 2, 50 km al suroeste de Curaray, 1°47′S, 76°48′W, 365 m, 1–19 oct. 1990 (fl), *D. Rubio & T. Coba 855* (holótipo, QCNE; isótipos, K, MO). Figura 2.

Trichiliae martianae C. DC. affinis sed (3–)5 foliolis obovatis, glabris, petalis valvaceis, capsula ample ovoidea aut subsphaerica haud triangulata praeter basim, brunnea in sicco, semper 6 seminibus praedita differt.

Arbusto a árbol mediano de 2–6 m de altura, dioico. Ramitas y yemas jóvenes adpresadamente pubérulas (estrigulosas) a subglabras, a veces con pequeñas lenticelas. Hojas imparipinnadas, 15–25 cm de longitud (incluído folíolo terminal); pecíolo semiterete; raquis semiterete a estrechamnete canaliculado cerca al último par de folíolos; pecíolo y raquis esparcidamente estrigulosos o glabros; peciólulos 0.5–2 cm de largo, estrechamente canaliculados, peciólulo del folíolo terminal hasta 2.5 cm de largo. Folíolos opuestos, (3–)5, el último par y folíolo terminal obovados, menos frecuente oblanceolados, los folíolos basales elípticos; ápice cuspidado-apiculado; base decurrente en el folíolo terminal, aguda en los folíolos inferiores, (5–)8–20 × 3–9 cm con una reducción constante en tamaño desde el ápice hacia la base, membranosos a subcoriáceos, glabros por ambos lados, oscuramente pelúcido-punteados, lisos en la haz. Nervación eucamptódroma-broquidódroma, 7–12 nervios secundarios a cada lado del nervio medio, nervios terciarios oscuramente reticulados. Inflorescencia axilar, una panícula, 7–20 cm de largo, esparcidamente pubérula-estrigulosa; ramificaciones laterales hasta 5 cm de largo; pedicelos 2–3 mm de largo. Flores unisexuales (vistas ♀). Cáliz pateliforme, ± 0.5 mm de largo; lóbulos 5, agudos, esparcidamente pubérulos. Pétalos 5, libres, valvados, 2.3–2.8 × 0.8–1.1 mm, oblongo-lanceolados, esparcidamente pubérulos por fuera, glabros por dentro. Tubo estaminal ± urceolado, 1.7–2 mm de largo. Filamentos unidos en la mitad basal, glabros por fuera, densamente barbados en la base, en la porción libre de los filamentos por dentro, y en los márgenes. Anteroides 10. Nectario ausente o aparentemente soldado a la base del ovario. Ovario estrechamente ovoide, pubescente, 3-locular, 2 óvulos colaterales por cada lóculo; estilo pubescente; estigma capitado. Cápsula 3-valvada, ± ovoide y ligeramente trígona-truncada en la base, o subglobosa y con la base redondeada, 1–1.6 cm de diámetro, a veces ligeramente más ancha que larga, densa y minutamente papilosa con pelos estrigulosos dispersos, ápice agudo a obtuso; valvas libres en las ⅔ partes de su longitud. Semillas 6, 2 por cada lóculo, colaterales, de forma de un segmento de una naranja, 0.5–0.8 cm de largo, totalmente cubiertas por un arilodio membranoso rojo.

Distribución. Trichilia obovata es una planta arbustiva a un árbol mediano, no superior a 6 m de altura en bosque primario, sobre suelos rojos de colinas o aluviales de la Amazonía occidental de Ecuador y Perú, bajo los 300 m de altitud.

Trichilia obovata es estrechamente relacionada a *T. martiana* C. DC., de la que difiere fundamentalmente por los (3–)5 folíolos obovados u oblanceolados, glabros, con 7–12 nervios secundarios a cada lado del nervio medio, pétalos valvados, fruto ligeramente ovoide y con la base ± trígona, o subgloboso y con la base redondeada, 1–1.6 cm de diámetro, pardo-gris cuando seco, semillas 6 cubiertas totalmente por un arilodio membranoso. *Trichilia martiana*, por el contrario se caracteriza por sus (5–)7–9(–11) folíolos oblanceolados, cuneiformes o estrechamente oblongos, con 12–17 nervios secundarios a cada lado del nervio medio, pétalos imbricados, fruto ovoide fuertemente trígono en la base, 0.8–1.2 cm de largo y característicamente pardo-rojizo cuando seco, semillas 2–3 por fruto, cubiertas parcialmente por el ápice y parte adaxial por un arilodio. Aunque por la posición de los pétalos *T. martiana* pertenece a la sección *Trichilia* (con pétalos imbricados o quincunciales) y *T. obovata* a la sección *Moschoxylum* (con pétalos valvados) (secciones de *Trichilia* según Pennington & Styles, 1981), el tubo estaminal y demás caracteres determinan una mayor afinidad de *T. obovata* con *T. martiana* que entre *T. obovata* y otras especies de la sección *Moschoxylum*.

En Ecuador, *T. martiana* sólo ha sido encontrada en la parte costera. Las flores de *T. obovata* han sido registradas entre septiembre y octubre; los frutos en agosto, septiembre, abril, y mayo.

Colecciones revisadas. ECUADOR. **Sucumbíos:** 1.1 km al E del Río Conejo en camino a Lago Agrio, 340 m, *Dwyer & MacBryde 9781* (MO); Tarapoa, 1 km de Pozo Petrolero Mariann 3, 0°08′S, 76°22′W, 240 m, *Cerón & Ayala 9712* (QCNE); 6 km N de Shushufindi, hacia Dureno, 0°10′S, 76°40′W, 250 m, *Palacios et al. 838* (MO, QAME). **Napo:** Cañón de los Monos, 15 km N de Coca, Hacienda de H. Noboa, 0°20′S, 77°01′W, *Neill et al. 6310* (MO, QCNE), *Zaruma et al. 85* (MO, QCNE); margen izquierda del Río Napo, arriba de la unión con el Río Payamino, 0°30′S, 77°00′W, 250 m, *Palacios & Neill 1138* (MO, QCNE); Estación Experimental INIAP–Napo, Payamino, 5 km N de Coca, Reserva Florística El Chuncho, 0°25′S, 77°00′W, 250 m, *Palacios & Neill 1229* (MO, QCNE). PERU. Valle del Río Santiago, 65 km N de Pinglo, Quebrada Caterpiza, 2–3 km de la Comunidad Caterpiza, 200 m, *Huashikat 1362, 2345* (MO).

Guarea riparia W. Palacios, sp. nov. TIPO: Ecuador. Zamora–Chinchipe: Punta de Pachicutza, entre Pachicutza y Miazi, orilla del Río Nangaritza, 4°10′S, 78°37′W, 900 m, 20 oct. 1991 (fl), *Palacios 8444* (holótipo, QCNE; isótipos K, MO, QCA). Figura 3.

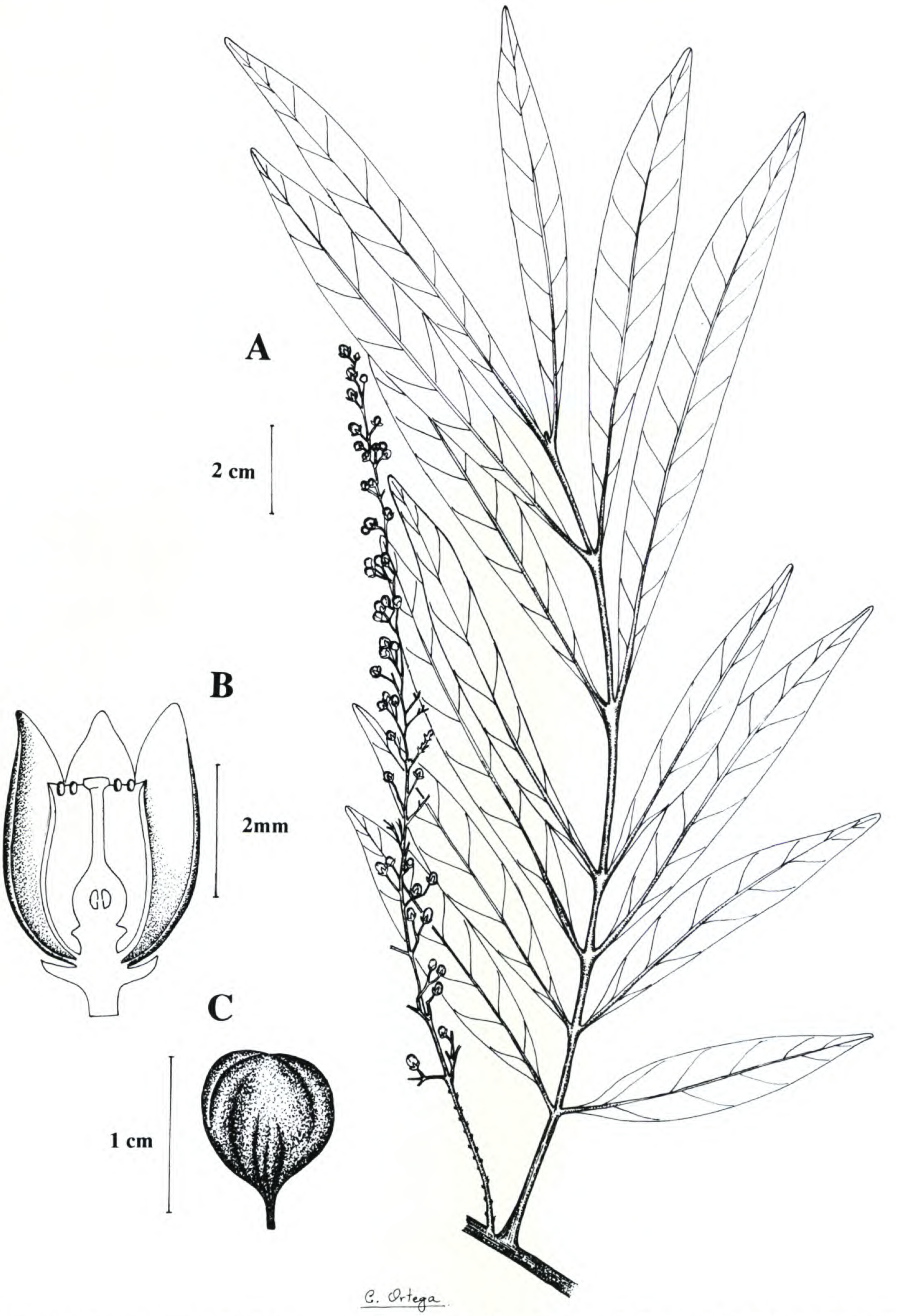

Figura 3. *Guarea riparia* W. Palacios. —A. Hábito. —B. Flor abierta. —C. Fruto. (A–B, *Palacios 8444;* C, *Palacios 6617.*)

Ab omnibus speciebus generis notis 2–6 foliolis finis, acuminatis, base late cuneata decurrenti, 6–10 cm longis et 1–2(–2.5) cm latis optime distincta.

Arbusto ripario de 1–3 m de altura, dioico. Ramitas lenticeladas. Yemas pubescentes. Hojas agrupadas en las puntas de las ramitas; yema terminal de la hoja con crecimiento contínuo; pecíolo semiterete, 1.5–2.5 cm de largo; raquis terete o angostamente canaliculado, 4–15 cm de largo; peciólulos engrosados, 3–5 mm de largo. Folíolos opuestos, 2–6 pares, linear-lanceolados, 6–10 × 1–2(–2.5) cm, cartáceos, ápice acuminado, base largamente cuneada-decurrente, glabros por ambos lados, excepto a veces con pelos dispersos a lo largo del nervio medio por el envés, brillantes por la haz; nervios secundarios 7–12 pares, tenues. Inflorescencia axilar, un tirso estrecho con muchas flores, (3–)5–15 cm de largo; ramificaciones laterales hasta 1.5 cm de largo; pedicelos 2 mm de largo. Flores unisexuales (vistas ♂). Cáliz pateliforme, 1–2 mm de largo, irregularmente (2–)3–4 lobado, esparcidamente estriguloso a subglabro; los lóbulos con el ápice agudo a obtuso. Pétalos 4, valvados, oblongos, 3.5–4.5 × 1–2 mm, pubérulos por fuera, glabros por dentro, papilosos en el ápice. Tubo estaminal cilíndrico-urceolado, 2.5–3.5 mm de largo, glabro, margen crenado; anteras 8. Nectario un corto estipe prolongado para formar un anillo ancho en la base del ovario, glabro. Ovario (3–)4-locular con un óvulo por lóculo, adpreso-pubescente; estilo glabro; estigma capitado. Cápsula (sólo inmaduras vistas) turbinada a globosa, 4-locular, 0.6–1.2 cm de largo, truncada en el ápice, esparcidamente pubérula. Semillas una por lóculo.

Guarea riparia es un arbusto de la base de las estribaciones de la Cordillera del Cóndor. En el Río Nangaritza entre Pachicutza y Miazi, sitio de la colección tipo, la especie es una planta común de la vegetación no alterada de las orillas del río. La especie forma poblaciones densas exclusivamente en la orilla rocosa del río. Está asociada con *Zygia longifolia* (Humboldt & Bonpland ex Willdenow) Britton & Rose, especie también riparia con la cual a simple vista se confunde. *Guarea riparia* es muy resistente a las fuertes y contínuas crecidas del río, observándose sobre las ramas y follaje huellas y restos de vegetación, dejadas por las subidas del nivel de las aguas. La especie no crece en áreas donde la vegetación riparia primaria ha sido alterada. Las hojas en estado natural son brillantes por la haz, el cáliz es rosado, la corola crema, y los frutos castaño-pardos o pardo-rojizos. La principal época de floración ocurre entre octubre y noviembre, en tanto que los frutos jóvenes han sido vistos en diciembre.

La especie es drásticamente distinta de las especies conocidas del género por los folíolos linear-lanceolados de 1–2(–2.5) cm de ancho, acuminados y la base cuneada-decurrente. *Guarea glabra* Vahl, y *G. macrophylla* Vahl, las especies más relacionadas, tienen folíolos oblongos, elípticos, de 3–7 cm de ancho.

Colecciones revisadas. ECUADOR. **Zamora–Chinchipe:** Punta de Pachicutza, entre Pachicutza y Miazi, orilla del Río Nangaritza, 4°12′S, 78°38′W, 900–950 m, *Neill 9660* (MO, QCNE), *Palacios 6613, 6617, 8439, 8460* (K, MO, QCA, QCNE). PERU. Bagua, Río Comaina, cerca del Puesto Comando Chávez Valdivia, 300–350 m, *Ferreyra 19471* (MO).

Guarea ecuadoriensis W. Palacios, sp. nov. TIPO: Ecuador. Napo: Coca, Reserva Florística El Chuncho, 0°27′S, 77°01′W, 250 m, 17 jun. 1987 (fl), *W. Palacios 1633* (holótipo, QCNE; isótipos, K, MO). Figura 4.

Ab omnibus speciebus notis generis partibus vegetativis junioribus dense aureo-velutinis, foliolis base rotundata vel breviter subcordatis, inferne tomentosis, 22–34 vel ultra nervis secundariis binis, ovario 7–9-loculari, stylo supra ovarium curvato, capsula dense tomentoso-velutina optime distincta.

Arbol hasta 20 m de altura y 30 cm de DAP, dioico. Fuste recto, poco ramificado. Partes jóvenes densamente dorado-velutinas. Hojas 50–120 cm de largo, extendidas horizontalmente, con una yema velutina de crecimiento contínuo muy evidente; pecíolo fuertemente acanalado, con la base envolviendo a la ramita, densamente dorado-velutino; raquis ± 2-sulcado lateralmente (un surco a cada lado en el plano de los folíolos), densamente velutino; peciólulos 1–5 mm de largo. Folíolos opuestos, raramente subopuestos, hasta 15 pares, 22–50(–70) × 9–16(–20) cm, típicamente oblongos a largamente oblongos, cartáceos; ápice mucronado a corto-acuminado; base redondeada a ligeramente subcordada; haz escasamente pubescente-tomentoso; envés tomentoso. Nervación prominente, eucamptódroma-broquidódroma; nervios secundarios 22–34 pares o más, densamente tomentosos; algunos nervios intersecundarios aislados; nervios terciarios más o menos oblícuos entre si. Inflorescencia axilar o naciendo sobre axilas de hojas caídas, una panícula pendiente con crecimiento contínuo, 20–95 cm de largo, densamente dorado-tomentosa; ramificaciones de la inflorescencia escasas, en la base o de la mitad hacia abajo, hasta 20 cm de largo; pedicelos 4–10 mm de largo; bracteolas 4–6 mm de largo, ovadas, lanceoladas. Flores unisexuales (vistas ♂), 1.6–2.2 mm de largo. Cáliz ciatiforme, 6–9 mm de largo, 2–3 lobado, pubescente. Pétalos (5–)6–7, largamente

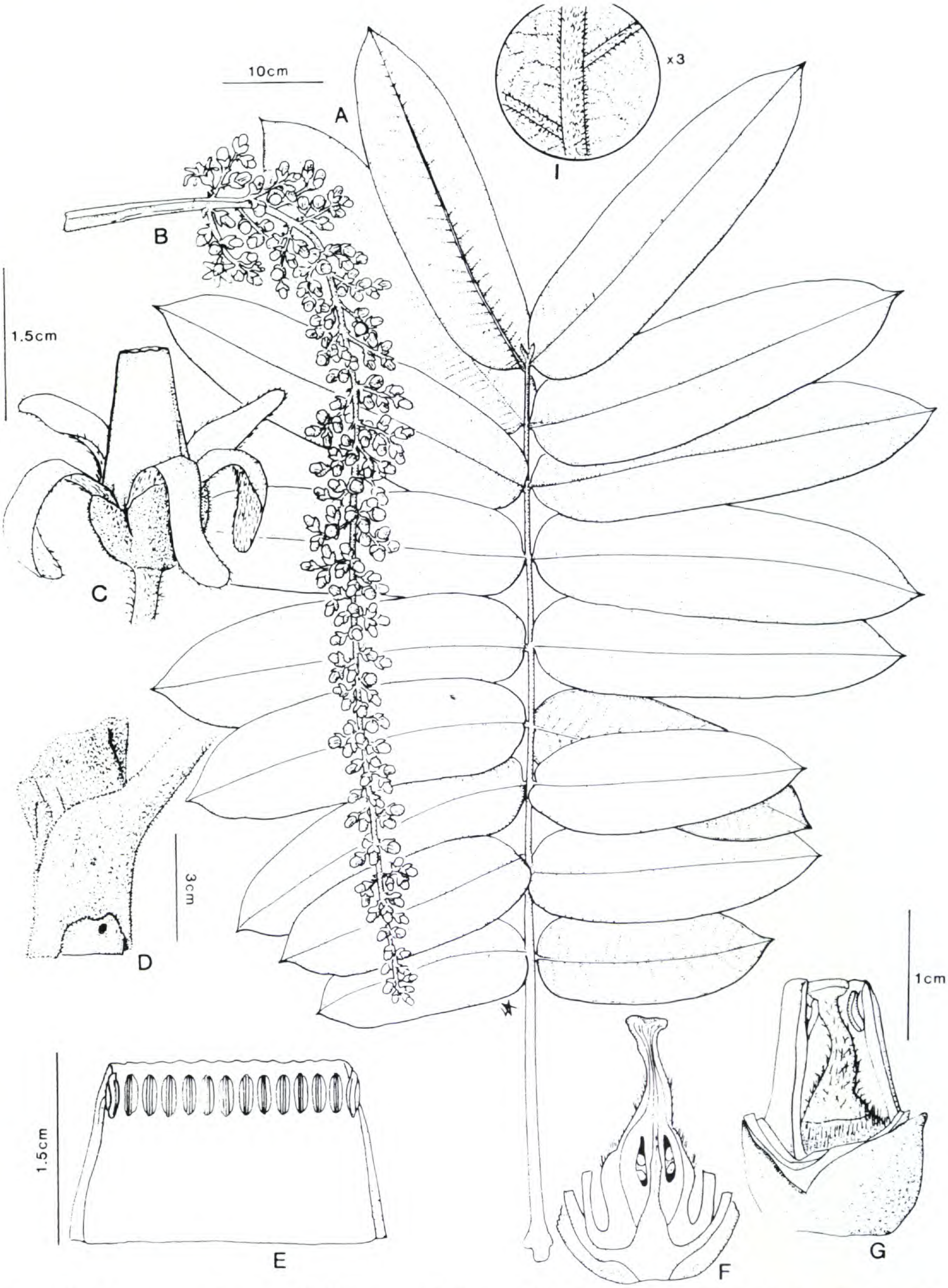

Figura 4. *Guarea ecuadoriensis* W. Palacios. —A. Hoja. —B. Inflorescencia. —C. Flor (cáliz, pétalos, y tubo estaminal). —D. Base del pecíolo. —E. Tubo estaminal abierto. —F. Corte longitudinal del ovario. —G. Ovario. (A–G, *Palacios 1633.*)

oblongos a ligeramente lanceolados, 18–20 × 4–6 mm, agudos, recurvados, pubescentes. Tubo estaminal ovoide-cilíndrico, 12–15 mm de largo, 3.5–4 mm de diámetro en el ápice, 8–10 mm en la parte más ancha; anteras (12–)13–14. Nectario ancho, ± estriado. Ovario 7–9-locular, pubescente-híspido, 2 óvulos sobrepuestos por lóculo; estilo curvado arriba del ovario (base del estilo), hirsuto; estigma capitado-discoide. Cápsula globosa, obovoide, 7–9-locular, 4–6 × 4–6 cm, truncada o redondeada en el ápice, densamente dorado pubescente-velutina; pericarpio 0.8–1.1 cm de grosor, 1–2 semillas sobrepuestas por lóculo, a veces una abortiva, elípticas-aplanadas si se desarrollan solas, truncadas en el ápice o base si hay 2 por compresión.

Distribución. Amazonía occidental en Ecuador, Perú, y Colombia bajo los 400 m, en bosque tropical húmedo sobre suelos aluviales relativamente fértiles.

Guarea ecuadoriensis es una especie absolutamente distinta del resto de especies de *Guarea* conocidas. En el campo, es fácilmente distinguible por su fuste recto, pobremente ramificado, las ramitas terminales y yemas densamente dorado-velutinas, las enormes hojas, y los folíolos numerosos de hasta 70 cm de largo con más de 22 pares de nervios secundarios, densamente dorado-tomentosos por el envés.

Es difícil establecer relaciones claras entre *G. ecuadoriensis* y otras del género, porque habiendo caracteres comunes, hay otros que son drásticamente distintos entre la especie descrita y las especies conocidas. Dos especies (*G. macropetala* Pennington y *G. carapoides* Harms) tienen caracteres comunes importantes. *Guarea macropetala* es semejante a la especie descrita por las flores grandes, el ovario 7–9-locular, y los frutos de 5 cm de largo, pero máximo con 8 pares de folíolos con la base atenuada, 14–23 cm de largo, y 10–15 pares de nervios secundarios. *Guarea carapoides*, una especie de la que únicamente existe una foto y un fragmento de colección (Pennington & Styles, 1981), es quizá la especie más relacionada a *G. ecuadoriensis*. La colección de *Vásquez & Jaramillo 2454* (MO) del Alto Amazonas, en Shucushuyacu, Perú, corresponde casi exactamente a la descripción hecha por Harms y completada por Pennington para *G. carapoides;* sin embargo, aunque en tamaño de hojas y folíolos, número y tamaño de pétalos son semejantes, *G. ecuadoriensis* tiene un ovario 7(–9)-locular en lugar de (11–12–)13-locular de *G. carapoides*. Adicionalmente la especie descrita es fuertemente distinta por el indumento tomentoso-velutino de sus partes jóvenes e inflorescencias y otras partes de la planta, en lugar del indumento pubérulo de todas las partes de *G. carapoides*.

Un carácter muy importante para establecer relaciones entre las especies de *Guarea* según Pennington & Styles (1981) y considerado válido aquí, es el fruto. Las especies con frutos mayores a 5 cm de diámetro y 7 o más lóculos son *G. carinata* Ducke, *G. grandifolia* DC., *G. macropetala*, y *G. purusana* C. DC., posiblemente también *G. carapoides* de la que no se conoce el fruto. Estas especies tienen frutos glabros, pubérulos, pero nunca tomentoso-velutinos, siendo muy distintas en los caracteres de las hojas a *G. ecuadoriensis*.

Colecciones revisadas. ECUADOR. **Napo:** Coca, Estación Experimental INIAP-Payamino, 5 km N de Coca, 0°25′S, 77°00′W, 250 m, *Palacios et al. 1285* (MO, QAME, QCNE), *Palacios 3193* (MO, QCNE). PERU. **Loreto:** Maynas, Iquitos, carretera Iquitos–Nauta, 4°10′S, 73°20′W, 120 m, *Vásquez & Soto 8324* (MO), *Vásquez et al. 6599* (MO). COLOMBIA. **Amazonas:** Leticia, Parque Nacional Natural Amacayacu, Centro Administrativo Mata-Mata, km 4, 0°47′S, 70°15′W, 120 m, *Rudas & Prieto 3164* (MO).

Ruagea membranacea W. Palacios, sp. nov. TIPO: Ecuador. Napo: El Chaco, margen derecha del Río Quijos (Coca), La Ave Brava, 0°36′S, 77°31′W, 1,800–1,900 m, sep. 1990 (fl), *Palacios 5445* (holótipo, QCNE; isótipos, K, MO, QCA). Figura 5.

Ruageae insigni (C. DC. in J. D. Smith) Pennington affinis sed gemmis nudis, foliolis membranaceis, glabris, acuminatis, inflorescentia laxa, pauciflora, pedicellis 6–9 mm longis abunde differt.

Arbusto a arbolito de hasta 5 m de altura, dioico. Corteza del fuste densamente lenticelada, las lenticelas de 2–3 mm de ancho por 10–30 mm de largo. Ramitas jóvenes con pelos estrigulosos dispersos, lenticeladas. Yemas jóvenes densamente pubescentes, desnudas. Hojas helicoidales, imparipinnadas, 13–30 cm de largo (incluido el folíolo terminal); pecíolo terete con pelos estrigulosos dispersos; raquis terete con pelos estrigulosos dispersos o concentrados solamente en la unión de los peciólulos; peciólulos laterales 2–5 mm de largo, peciólulo terminal hasta 2 cm de largo. Folíolos opuestos, menos frecuente subopuestos, (7–)9–11, oblongos a elípticos, los folíolos basales suborbiculares, membranosos, minutamente pelúcido-punteados, 4–15 × 2.5–4.5 cm; ápice acuminado; base ligeramente asimétrica, cuneada a atenuada o ± decurrente en el folíolo terminal; haz y envés glabros, raramente con pelos estrigulosos dispersos a lo largo del nervio medio y papilas rojizas diminutas por el envés; margen con pelos dispersos; nervios secundarios 6–14 pares, intersecundarios conspicuos; terciarios finamente reticulados. Inflorescencia axilar, una panícula laxa con pocas flores, 10–25 cm de largo; ramificaciones

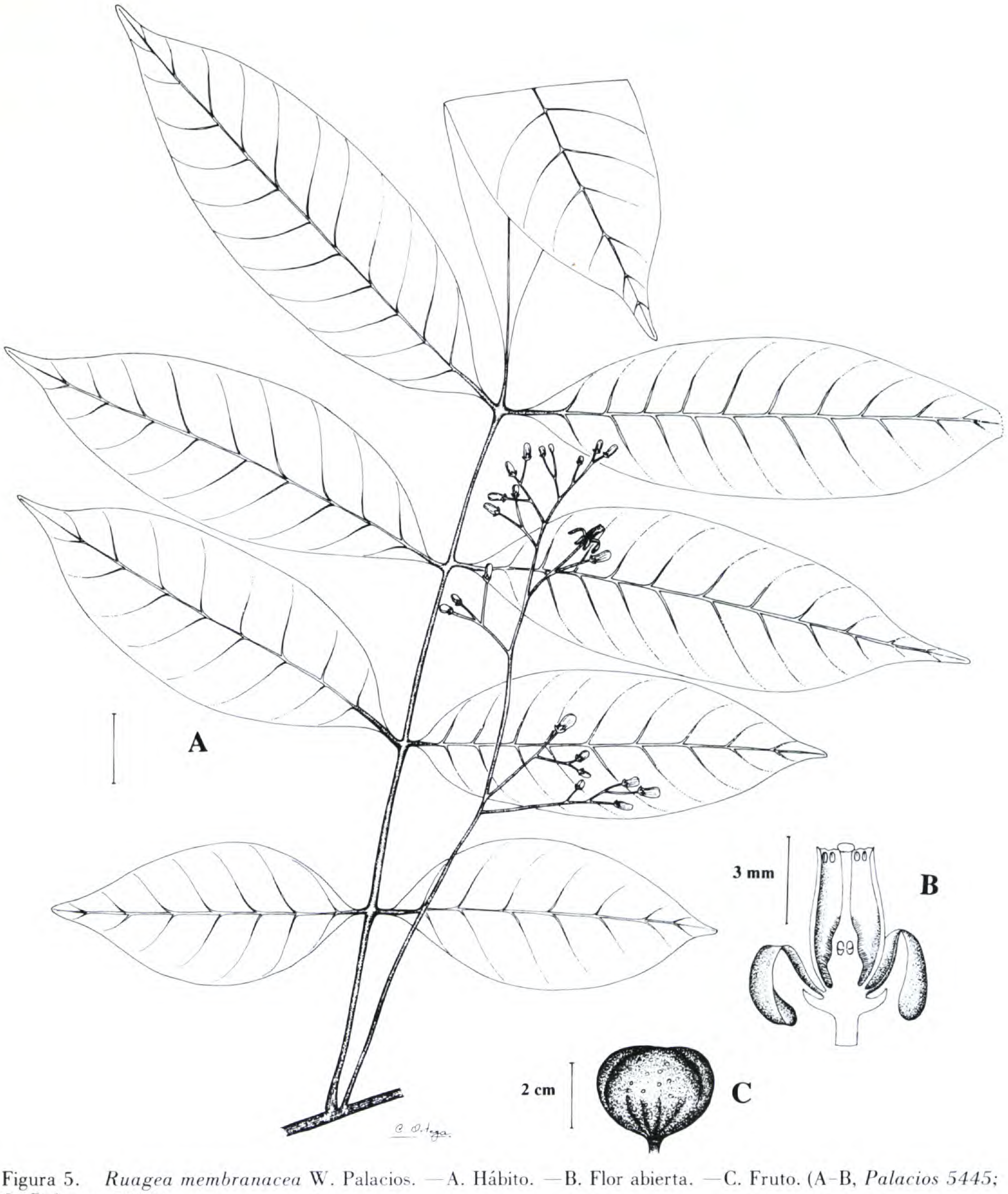

Figura 5. *Ruagea membranacea* W. Palacios. —A. Hábito. —B. Flor abierta. —C. Fruto. (A–B, *Palacios 5445*; C, *Palacios 5333*.)

laterales hasta 6 cm de largo, glabras o con pelos estrigulosos dispersos; pedúnculo aplanado; pedicelos 6–9 mm de largo, articulado ± en la parte media. Cáliz pateliforme; sépalos 5, ovados a suborbiculares, 0.5–0.8 mm de largo, glabros. Pétalos 5, oblongos, 6–7.5 × 1.5–3 mm, glabros, ápice redondeado. Tubo estaminal cilíndrico cerca 5.5 mm de largo, glabro, minutamente crenado. Anteras 10. Nectario representado por un estipe ancho debajo del ovario. Ovario 3–5-locular, glabro o con pelos dispersos; dos óvulos sobrepuestos por cada lóculo; estilo discoide. Cápsula globosa o subglobosa, 3–4(–5) valvada, 1–2.5 cm de diámetro, densamente lenticelada; semillas 1–2 sobrepuestas por lóculo, cubiertas por un arilodio rojo, generalmente 1–3 semillas por fruto, raramente hasta 5, 0.8–1.2 cm de largo.

Distribución. Aparentemente es una especie endémica a las faldas del Volcán Sumaco y alrededores, una zona con más de 4,500 mm de precipitación

en las faldas orientales de los Andes en Ecuador. Es un arbusto o un arbolito mediano, común en el bosque primario entre 1,600–1,900 m; alcanza los 5 m de altura y 7 cm de DAP. La madera es rosada-oscura y muy dura. Las flores de color crema-verdosas ocurren de septiembre a octubre. Los frutos han sido colectados en octubre en árboles que también tenían botones florales.

Las especies de *Ruagea* son mayormente distinguibles por sus hojas y frutos. Las flores, a más de su tamaño, no tienen caracteres taxonómicos muy útiles. Según Pennington & Styles (1981), se reconocen cinco especies para la *Flora Neotropica*, todas con folíolos cartáceos a coriáceos, no acuminados, pubescentes en diferentes grados.

Ruagea membranacea tiene folíolos completamente membranosos, casi transparentes cuando son jóvenes, acuminados, y glabros. *Ruagea insignis* (C. DC. in J. D. Smith) Pennington, un árbol grande de tierras bajas (< 900 m), es la única especie conocida del género con folíolos glabros, pero ésta tiene un conjunto de escamas distintivas que cubren las yemas jóvenes, y hojas y folíolos mucho más grandes.

Aún las especies consideradas como dudosas por Pennington, son diferentes. Asi, *R. raimondii*, *R. smithii*, y *R. tomentosa*, tienen folíolos villosos, pubescentes, o tomentosos.

Colecciones revisadas. ECUADOR. **Napo:** El Chaco, margen derecha del Río Quijos (Río Coca), La Ave Brava, 0°36′S, 77°31′W, 1,800–1,900 m, *Palacios 5309, 5333* (MO, QCA, QCNE); Cantón Archidona, Faldas del Volcán Sumaco, sendero entre El Pacto y Huahua Sumaco, 0°36′S, 77°35′W, 1,700–1,900 m, *Palacios & Neill 4714* (MO, QCA, QCNE).

Ruagea microphylla W. Palacios, sp. nov. TIPO: Ecuador. Loja: carretera Loja–La Toma, Cerro Villonaco, a 20 km de Loja, 2,200–2,400 m, ago. 1983 (fl), *Jaramillo & Winnerskjold 5681* (holótipo, AAU).

Ruageae hirsutae (C. DC.) Harms affinis sed 5–15 foliolis oppositis, oblongis vel oblongo-oblanceolatis, base inaequali-acuta vel base inaequali-cuneiformi, 2–6 cm longis et 1–1.5 cm latis, glabris non nisi pilis strigosis sparsis praecipue nervum medianum secus, inflorescentia thyrsoidea, 2.5–5 cm longa, differt.

Arbusto a arbolito hasta 5 m de altura, dioico. Ramitas terminales y yemas adpreso-pubérulas (estrigulosas), papilosas. Hojas imparipinnadas, 5–14 cm de largo (incluido folíolo terminal); pecíolo semiterete, adpreso-pubérulo (estriguloso), raquis irregularmente semiterete, esparcidamente estriguloso; papiloso. Folíolos opuestos, 5–15, sésiles o peciólulos menores a 2 mm de largo, oblongos a ligeramente oblongo-oblanceolados, el folíolo terminal ± elíptico, 2–6 × 1–1.5 cm, coriáceos, ápice obtuso, agudo, base asimétrica-aguda, cuneada, glabros o únicamente con pelos estrigulosos dispersos, principalmente a lo largo de los nervios, mezclados con papilas rojas. Nervación eucamptódroma a oscuramente broquidódroma; nervios secundarios oscuros, tenues a prominulentos, 6–12 pares, irregularmente convergentes; nervios intersecundarios oscuros, cortos, sinuosos. Inflorescencia axilar, un tirso estrecho, 2.5–5 cm de largo, densamente estriguloso; ramificaciones laterales hasta 1.3 cm de largo. Flores unisexuales (vistas ♀). Sépalos 5, libres, 0.8–1 mm de largo, estrigulosos, ciliados. Pétalos 5, libres, quincunciales, oblongos a espatulados, 4–5 × 1–2 mm, glabros. Tubo estaminal cilíndrico, 3–4 mm de largo, 2–3 mm de diámetro, glabro. Anteroides 10. Nectario un anillo expandido debajo del ovario. Ovario estrechamente ovoide, 3-locular, cada lóculo con 2 óvulos sobrepuestos, pelos erguidos en la base; estilo glabro, estigma discoide. Fruto (inmaduro) globoso, pubérulo.

La nueva especie es conocida solamente del sur del Ecuador, entre 2,200–2,500 m, en áreas disturbadas o en bosque primario. Es distinta de otras especies del género por los folíolos pequeños, glabros o sólo con pelos estrigulosos dispersos. *Ruagea hirsuta* (C. DC.) Harms, la especie más cercana, raramente tiene folíolos menores a 5 cm de largo, pero usualmente son también más anchos, casi siempre hirsutos y más numerosos.

Colecciones revisadas. ECUADOR. **Loja:** Loja–Saraguro, km 25, Buenavista y Taquil, 0°54′S, 79°20′W, 2,400–2,550 m, *Jørgensen & Ulloa 92005* (AAU, QCA); El Cisne–Gualel, 3°52′S, 79°20′W, 2,330–2,650 m, *Freire et al. 1023* (AAU).

Agradecimientos. Dejo constancia de gratitud a David Neill por la revisión de este documento, a María Burbano y todo el personal del Herbario Nacional del Ecuador, a Daniel Rubio, a la Fundación Jatun Sacha, y al proyecto SUBIR por todo el apoyo brindado en los inventarios florísticos. Un agradecimiento especial a Tarciso Filgueiras por la diagnosis en Latín y a Mary Merello.

Literatura Citada

Holdridge, L. 1987. Ecología Basada en Zonas de Vida. IICA, San José, Costa Rica.

Pennington, T. & B. T. Styles. 1981. Meliaceae. Flora Neotropica. 28. Organization for Flora Neotropica, New York.

New Species of *Swartzia* (Fabaceae: Faboideae) from Amazonia

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ABSTRACT. Studies in Amazonian plant diversity have revealed the presence of two new species of *Swartzia*, *S. oscarpintoana* Pipoly & Rudas and *S. gracilis* Pipoly & Rudas.

RESUMEN. Estudios en diversidad vegetal amazónica revelaron la presencia de dos nuevas especies del género *Swartzia*, *S. oscarpintoana* Pipoly & Rudas y *S. gracilis* Pipoly & Rudas.

Swartzia oscarpintoana Pipoly & Rudas, sp. nov. TYPE: Colombia. Amazonas: Mcpio. La Pedrera, Inspección Santa Isabel, Parque Nacional Natural Cahuinarí, Río Cahuinarí, 01°28′S, 70°46′W, 300 m, 29 Nov. 1990 (fr), *J. Pipoly, A. Rudas et al. 12886* (holotype, COL; isotypes, F, FMB, GH, K, MO, NY, US). Figure 1.

Quoad stylum terminalem, stigma capitellatum atque ovarium arcuatum fusiformeque, praeclare ad sectionem *Terminalem* pertinet, et intra has propter ramulos dense chocolatino-nitido-velutinos, foliola imparipinnata coriacea supra nitida subtus dense chocolatino-velutina, inflorescentiam ramulinam racemosamque allopatricae *S. pictae* valde arcte affinis, sed ab ea pedicellis cylindricis (non clavatis), bracteis caducis (non persistentibus), lobulis calycinis 5–6 (non 4), gynophoro ovarioque dense adpresso-velutino (non glabro) denique stylo 8–12 (non 5–7) mm longo statim separabilis.

Tree to 40 m tall × 38 cm DBH; branchlets, stipules, petioles, leaf rachis, petiolules, and abaxial leaflet surface velvety with shiny chocolate-brown hairs; branchlets strongly 6–10-ribbed, the ribs rounded, disappearing with age, 5–10 mm diam.; pith moderately hard. Stipules caducous, coriaceous, extremely widely ovate, 5–7 mm long, 6–8 mm wide, apex rounded, velutinous without, glabrous within, the margin entire. Leaves imparipinnate; petioles terete, 0.5–1 cm long, conspicuously pulvinate; rachis subterete, slightly canaliculate adaxially, (10–)14–19.5 cm long, stipellate at each pair of leaflets, the stipels coriaceous, ovate, 2–3 mm long, 2–2.5 mm wide, apex acute, densely velutinous; petiolules subterete, 2–3.5 mm long, densely velutinous; leaflets 4–6-jugate, coriaceous, dimorphic, the basal pair obovate to oblanceolate, (4.5–)5–6.5(–9) cm long, 2.2–3 cm wide, apex short-acuminate, base truncate, the midrib impressed above, prominently raised below, secondary veins 12–16 pairs, nitid and punctate above, densely velutinous below, the margin revolute, entire; other leaflets narrowly oblong to narrowly oblanceolate, (7.5–)11–16 cm long, (1.8–)2.5–3(–4) cm wide, the apex abruptly acuminate, the acumen 0.7–1 cm long, the base obliquely truncate to subcordate, the midrib impressed above, prominently raised below, secondary veins 10–14, nitid and punctate above, densely velutinous below, the margin revolute, entire. Inflorescence ramuligerous, a simple axillary raceme, 10–20(–23) cm long; rachis erect, velvety with shiny chocolate-brown hairs; floral bracts coriaceous, ovate, 0.8–1.2 mm long, 0.6–0.8 mm wide, the apex acute, glabrescent above, densely velutinous below, caducous; bracteoles obsolete, without scars; pedicels cylindrical, 2–3(–5) mm long; calyx stiffly coriaceous, rupturing into 5–6 irregular lobes at maturity, 7–15 mm long, 3–6 mm wide, apex acute, densely appressed-velutinous without, glabrous within; corolla and androecium unknown; gynophore 1–2.5 cm long, the ovary fusiform, arcuate, 15–30 mm long, 3–5 mm diam., densely appressed-velutinous, the style black, 8–12 mm long, the stigma capitellate. Fruit, unknown.

Distribution. Known only from the type, collected in Amazonas, Colombia, 300 m elevation.

Ecology. Swartzia oscarpintoana grows in várzea forest on lateritic soils (rebalse alto), dominated by *Lepidocaryum tenue* Martius and *Astrocaryum jauari* Martius. It is a common element of the canopy at the margin of the várzea forest, on deep alluvial deposits near the *terra firme* transition zone.

Etymology. This species is named for Oscar Hernando Pinto, former regional director of INDERENA for the Amazon Basin of Colombia, whose collaboration and interest in the promotion of national parks as biodiversity research centers has

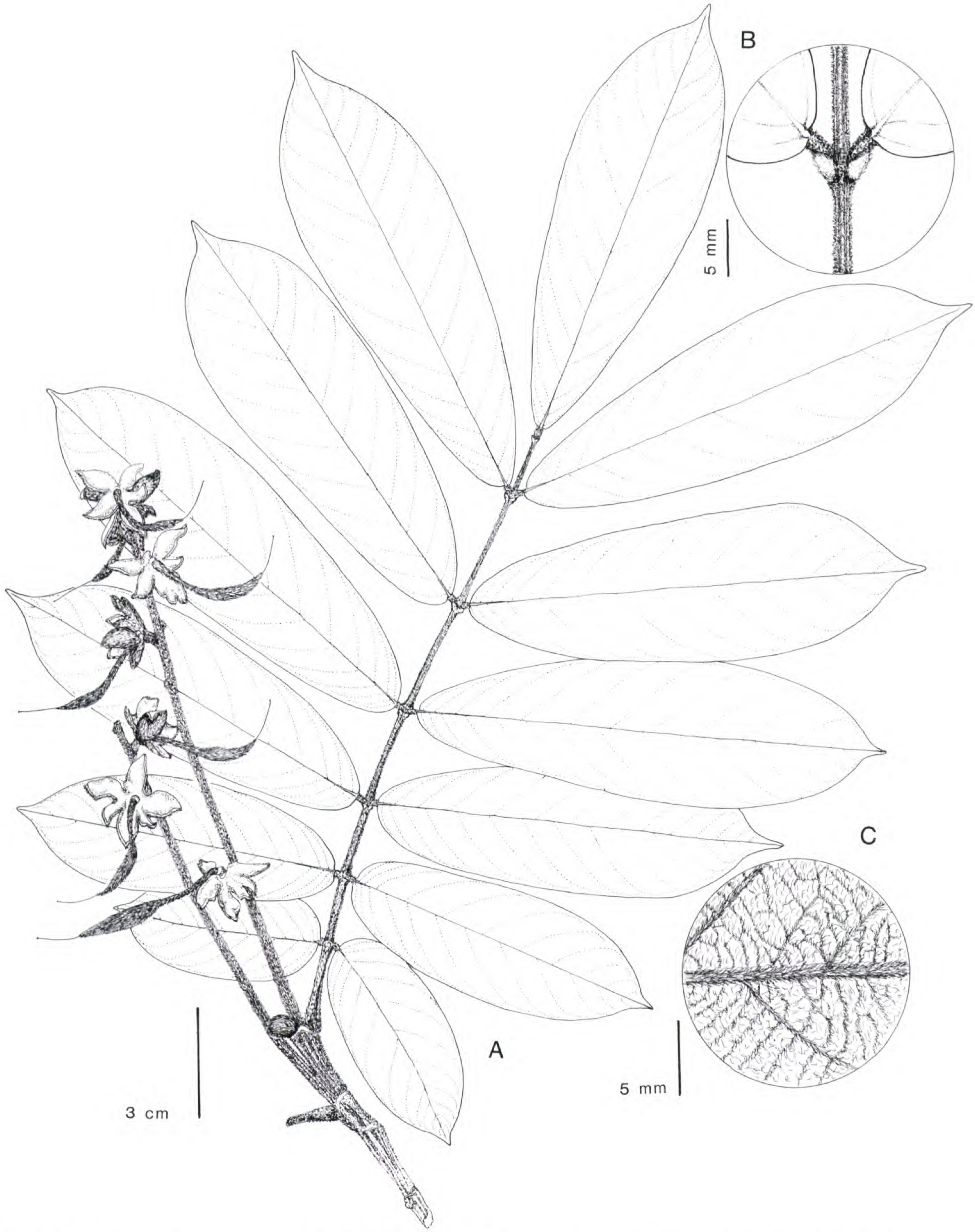

Figure 1. *Swartzia oscarpintoana* Pipoly & Rudas. —A. Flowering branchlet showing cylindrical pedicels, velutinous inflorescence rachis, gynophore, and ovary. —B. Leaflet pair, showing obliquely truncate bases, ovate stipules, and subterete leaf rachis. —C. Close-up of abaxial leaf surface, showing nitid-velutinous tomentum. A–C, drawn from the isotype.

permitted teaching and basic research in the Amazonian national parks of Colombia.

The terminal style, capitellate stigma, and arcuate and fusiform ovary indicate that *Swartzia oscarpintoana* belongs to section *Terminales*. Among the species of that section, the brown nitid-velutinous tomentum of the branchlets and abaxial leaf surfaces concomitant with the coriaceous leaves and racemose ramuligerous inflorescences indicates a close relationship to *S. picta* Spruce ex Bentham. How-

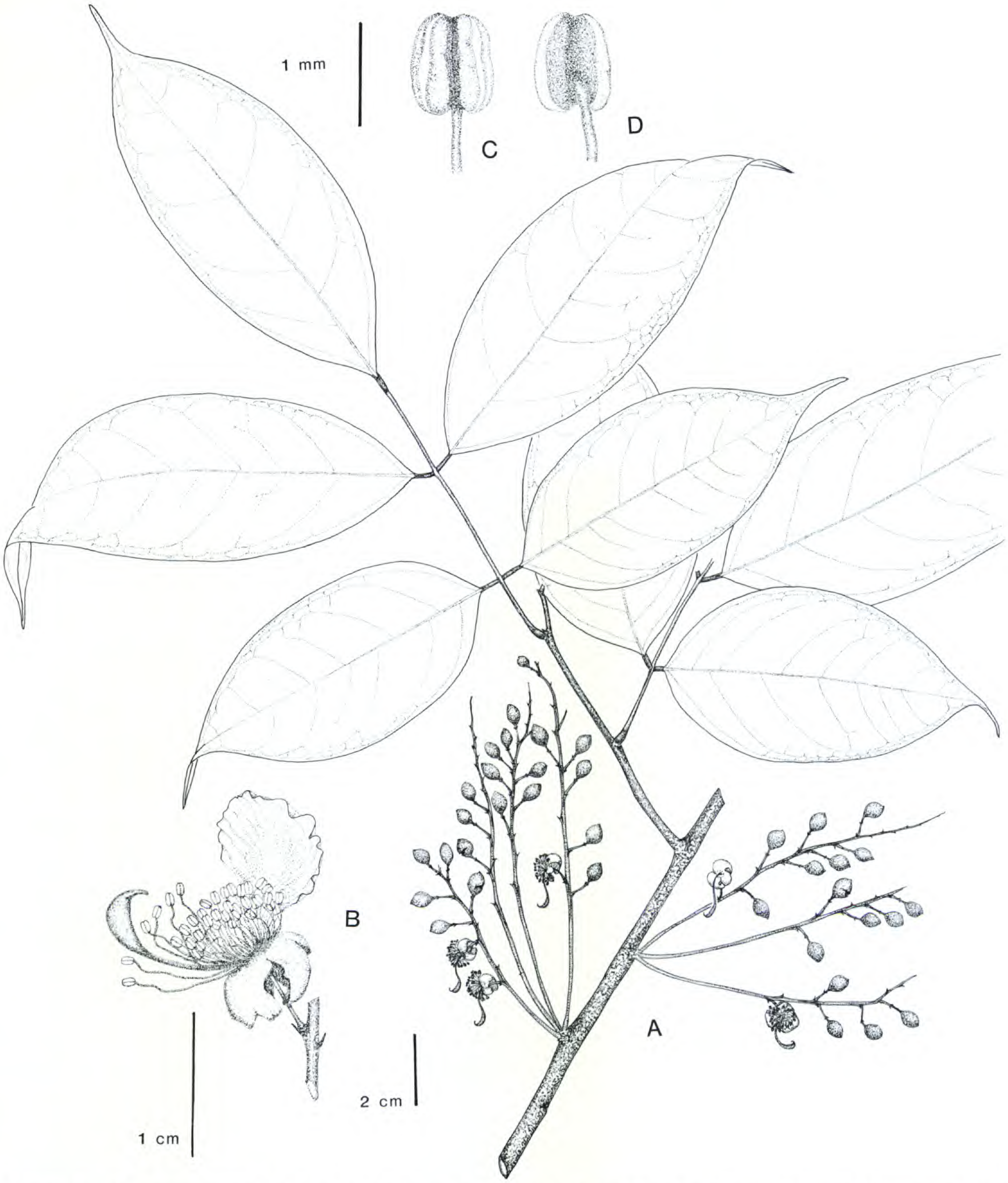

Figure 2. *Swartzia gracilis* Pipoly & Rudas. —A. Flowering branchlet showing ramuligerous inflorescences of fascicles of racemes. —B. Flower, showing suborbicular petal blade, falcate ovary, and punctiform stigma. —C. Anther, adaxial view. —D. Anther, abaxial view, showing darkened connective. A–D, drawn from the holotype.

ever, *Swartzia oscarpintoana* is readily separated from *S. picta* by the cylindrical pedicels, caducous floral bracteoles, 5–6-lobed calyx, the velutinous gynophore and ovary, and longer style.

Swartzia gracilis Pipoly & Rudas, sp. nov. TYPE: Peru. Loreto: Dtto. Iquitos, Estación Experimental del IAAP, Allpahuayo, Inventario Permanente, 04°10′S, 73°30′W, 150 m, 22 Mar. 1992 (fl), *R. Vásquez, S. Vásquez & N. Jaramillo 17951* (holotype, AMAZ; isotypes, COL, F, G, K, MO, NY, US, USM). Figure 2.

Propter stylum punctiformem, ovarium obovoideum, gynoecium glabrum, pedicellum bracteolis praeditum necnon foliola 1–4-juga ad sectionem *Swartziam* seriem *recurvam* pertinet; intra has quoad ramulos et inflorescen-

tiae rhachim dense minuteque aureo-malpighio-strigulosos, certeque perianthium glabrum *S. leiocalycinae* valde arcte affinis, sed ab ea stipulis late triangularibus (non deltatis) 1–1.3 (nec 0.5–0.7) mm longis, 1.1–1.5 (nec 0.5–0.7) mm latis, folii rhachide angulata (nec canaliculata), foliolis chartaceis (non coriaceis) ad bases acutis (nec rotundatis), petiolulis 6–8 (non 3–5) mm longis, inflorescentiis racemosis fasciculatis (nec paniculatis), bracteis 1 et bracteolis 2 (non 1) ad pedicelli basim atque apicem (nec non nisi ad basim tantum) insertis, denique staminibus majoribus 6 (non 2) praeclare distinguitur.

Subcanopy tree to 30 m tall, 45 cm DBH; branchlets terete, 2–4 mm diam., densely and microscopically golden biramous-strigulose, glabrescent; stipules chartaceous, widely triangular, 1–1.3 mm long, 1–1.5 mm wide, apex acute, densely biramous-strigulose, the margin entire, caducous. Leaves paripinnate or imparipinnate; petioles, rachis, and petiolules minutely biramous-strigulose; petioles very narrowly canaliculate, 5–7 mm long, conspicuously pulvinate, glabrous; rachis subterete, angulate, (4.5–)6–9(–12) cm long, stipels absent, distal rachis mucron 3–5 mm long, caducous; petiolules terete, adaxially very narrowly canaliculate, 6–8 mm long, glabrescent; leaflets 1–4-jugate, chartaceous, monomorphic, oblong to ovate, 7–14 cm long, (3.5–)4–6(–8) cm wide, apex caudate-acuminate, base acute, midrib slightly raised above, prominently raised below, the secondary veins 22–30 pairs, glabrous, nitid and epunctate above, pallid below, the margin flat, entire. Inflorescence ramuligerous and ramigerous, a fascicle of (1–)2–6 simple racemes, rarely axillary, 3.5–10 cm long; rachis erect, densely and microscopically golden biramous-strigulose; floral bract at pedicel base 1, chartaceous, subulate, 1–1.2 mm long, 0.1–0.2 mm wide, the apex acute, densely biramous-strigulose, the margin entire; bracteoles paired, inserted ca. ¾ length of pedicel from base, chartaceous, subulate, 0.7–0.8 mm long, ca. 0.1 mm wide, the apex attenuate, densely strigulose, the margin entire; pedicels cylindric, 5–7 mm long; calyx stiffly coriaceous, rupturing into 3 highly reflexed lobes at maturity, the lobes 6–8 mm long, 3–6 mm wide, glabrous; petal yellow, unguiculate, glabrous, the claw 3–5 mm long, the blade suborbicular, 4–6 mm long and wide, the apex truncate, the margin irregular, entire; larger stamens 6, 7–8 mm long, the filaments yellow, 6–7 mm long, the anthers oblong, 0.8–1 mm long, 0.6–0.8 mm wide, apex and base emarginate, the connective darkened dorsally; smaller stamens numerous, 0.5–0.6 mm long, the filaments 0.4–0.5 mm long, the anthers quadrate, 0.8–1 mm long and wide, the connective darkened dorsally; torus below gynoecium sparsely and minutely glandular-granulose; gynoecium glabrous, the gynophore 7–9 mm long, the ovary falcate, 5–6.5 mm long, 1.5–1.8 mm wide, abruptly curved apically, the style 0.7–1 mm long, the stigma punctiform. Fruit unknown.

Distribution. Endemic to the Iquitos area of Amazonian Peru and adjacent Brazil, at 150 m elevation.

Ecology. *Swartzia gracilis* is a subcanopy tree in tall *terra firme* moist forests on deep white sands.

Etymology. The epithet refers to the slender nature of the inflorescence in relation to the leaves.

The punctiform style, obovoid ovary, glabrous gynoecium, bracteolate pedicels, and 1–4-jugate leaflets clearly place *Swartzia gracilis* in section *Swartzia* series *recurvae* Cowan. Within that series, the densely and minutely golden biramous-strigulose hairs of the inflorescence rachis and branchlets and the glabrous perianth indicate a very strong relationship to *S. leiocalycina* Bentham, a species from the Guianas. However, the angulate foliar rachis, chartaceous leaflets with obtuse bases, longer petiolules, inflorescence consisting of a fascicle of racemes, three bracteoles with two at the top of the pedicel and one at the bottom, and longer stamens all serve to distinguish *Swartzia gracilis*.

Paratype. BRAZIL. **Amazonas:** Rio Javari, Rio Curaçá, 8 mi. above (S of) mouth, 26 Oct. 1976 (fl), *G. Prance et al. 24139* (INPA, MG, NY, US).

Acknowledgments. Our work in plant diversity and phytogeography in the Amazon Basin is supported by the generosity of the John D. and Catherine T. MacArthur Foundation. We are grateful to Roy Gereau for reviewing the manuscript and to Rodolfo Vásquez for providing the illustrations.

Una Nueva *Affonsea* (Fabaceae: Mimosoideae: Ingeae) de la Amazonía Peruana

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RESUMEN. Se describe e ilustra una nueva especie del género *Affonsea*, *A. gereauana*, proveniente de la región amazónica alrededor de Iquitos, Perú. Notable por sus pecíolos cortos, flores y hojas grandes, cáliz, corola y carpelos pubérulos, y por su estigma cupuliforme, *A. gereauana* tiene parentesco con *A. densiflora* Bentham, de Bahia, Brasil. Esta nueva especie es el primer reporte para el género en el Perú.

ABSTRACT. A new species of *Affonsea*, *A. gereauana*, from Amazonian Peru near Iquitos, is described and illustrated. Notable for its short petioles, large leaves and flowers, puberulent calyx, corolla, and carpels, and finally, cupuliform stigma, *A. gereauana* is related to *A. densiflora* of Bahia, Brazil. This new species is the first report for the genus from Peru.

Inventarios florísticos de las Reservas Allpahuayo, del Instituto de Investigaciones de la Amazonía Peruana (IIAP) y del Caserío Mishana, como parte integral de investigaciones florísticas para el subproyecto "Flórula de las Reservas Biológicas de Iquitos" han revelado una nueva especie del género *Affonsea* St. Hilaire. El género era conocido unicamente de Brasil, y comprende 7 especies notables por sus gineceos apocárpicos, con estilos libres.

Affonsea tiene *Inga* Miller como su género hermano, y se separa por la siguiente clave (Hutchinson, 1964: 292; Nielsen, 1981: 178).

1a. Gineceo de 2 a 6 carpelos, los estilos libres ..... *Affonsea*
1b. Gineceo de un solo carpelo, estilo uno ..... *Inga*

Esperando resultados de los investigadores que actualmente estan llevando a cabo revisiones taxonómicas de la tribu *Ingeae*, preferimos describir la entidad siguiente en el género *Affonsea*.

Affonsea gereauana Pipoly & Vásquez, sp. nov. TIPO: Perú. Loreto: Provincia de Maynas, Distrito de Sta. María de Nanay, Río Nanay, Caserío Mishana, 8 Sep. 1990 (fl), *R. Vásquez, O. Phillips & N. Jaramillo 14326* (holótipo, MO; isótipos, AMAZ, F, G, K, NY, P, US, USM). Figura 1.

Quoad rhachides foliares subteretes, glandes interfoliolares orbiculares, foliola 4–5-juga, coriacea nitidaque, *A. densifloram* Bentham simulans sed ab ea petiolis 5–10 (non 10–15) mm longis, foliolis terminalibus 26–40 (nec 12–15) cm longis, calyce 1.6–2 (non 3.3–4.8) cm longis, lobis calycinis 2–3 (non 6–8), subdeltatis puberulisque (nec lanceolatis viscidulo-tomentosisque), corollis 4.5–5.5 (non 2.5–3) cm longis, lobis corollinis puberulis (non tomentoso-villosis), carpellis puberulis (non glabris) denique stigmate cupuliforme (nec punctiforme) statim separabilis.

Arbol ca. 12 m de alto; ramitas teretes, conspícuamente lenticeladas, diminutamente puberulentas, glabrescentes; médula amplia, aparentemente fistulada; estípulas coriáceas, linear-oblongas a oblanceolado-falcadas, 10–25 mm de largo, 1.5–4 mm de ancho, ápice subulado, 3–5 estriado-nervadas y carinadas longitudinalmente. Hojas paripinnadas, brevipecioladas; pecíolo 5–10 mm de largo, raquis hueco, subterete, 20–37 cm de largo, mucronado en el ápice, el mucrón decíduo, 7–10 mm de largo; glándula foliar discoide, entre cada par de folíolos, ligeramente depresa en el centro, 1.5–2.2 mm de diám.; peciólulos teretes, 4–16 mm de largo, 2–5 mm de diám.; folíolos coriáceos, opuestos, peciolulados, 4–5 pares, glabros en la haz, diminutamente rufo-punteados en el envés, nervio medio emergente en ambas caras, nervios secundarios planos a ligeramente emergentes en la haz, emergentes en el envés, venación terciaria plana en ambas caras, los márgenes ligeramente revolutos, enteros, glabros; folíolos basales ovado-elípticos, (5.5–)9–13 cm de largo, (3.5–)5–9 cm de ancho, el ápice brevemente acuminado a obtuso, base redondeada, nervios secundarios 5–7 pares; folíolos centrales elípticos u oblongos, 22–40 cm de largo, 8–14 cm de ancho, ápice brevemente acuminado a obtuso, base subobtusa a cuneada, nervios secundarios 7–11 pares; folíolos terminales obovados a elípticos, 26–40 cm

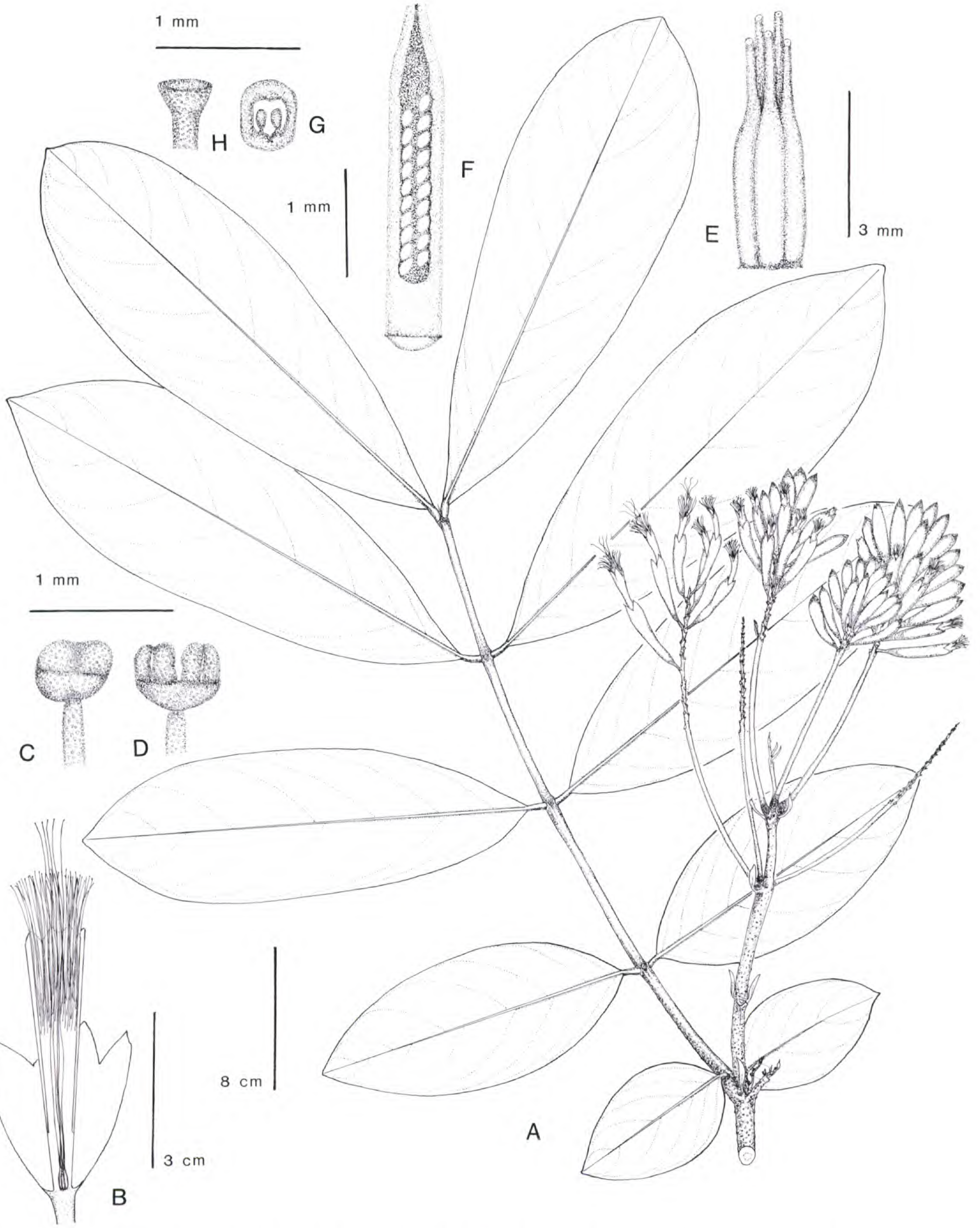

Figura 1. *Affonsea gereauana* Pipoly & Vásquez. —A. Rama fértil. —B. Sección longitudinal de la flor, mostrando los estilos separados y corola tubiforme. —C. Estambre inmaduro. —D. Estambre en antesis. —E. Gineceo, mostrando los carpelos apocárpicos. —F. Sección longitudinal de un carpelo, mostrando las dos filas de óvulos. —G. Sección transversal de un carpelo. —H. Apice de estilo con estigma cupuliforme. A–H, del holótipo.

de largo, 9–14 cm de ancho, ápice brevi-acuminado, obtuso o redondeado, base sub-obtusa a cuneada, nervios secundarios 9–12 pares. Inflorescencias axilares, sobre ramitas juveniles con hojas generalmente decíduas; con 1–3 racimos, pedúnculos, 2–15 cm de largo, frecuentemente lenticelados y diminutamente puberulentos; racimo 2–8 cm de largo, bráctea basal coriácea, elíptico-oblonga, obovada o falcada, 3–13 mm de largo, 1–4 mm de ancho; bractéolas florales coriáceas, diminutas e inconspícuas, decíduas; pedicelo cilíndrico, 4–7 mm de largo, 1–2 mm diám., articulado en la base; botones obovados u oblongos, rectos o curvados, 3.0–4.5 mm de largo; cáliz cartáceo, 3.3–4.8 cm de largo, dividido irregularmente en 2–3 lóbulos, el tubo 2.3–4.5 mm de largo, los lóbulos subdeltados, 3–5 mm de largo, 4–6 mm de ancho, diminutamente puberulentos en la base y hacia el ápice; corola tubiforme, verdosa, 4.5–5.5 cm de largo, el tubo 4–5 cm de largo, los lóbulos 3–5(–6), lanceolados, 4–7 mm de largo, ápice subulado, pubérulo, luego partiéndose irregularmente hasta 13 mm de profundidad; androceo de numerosos estambres, los estambres de 5.5–9.5 cm de largo, el tubo estaminal 3.0–4.8 cm de largo, adnato al tubo corolino 9–12 mm en la base; porciones libres de los filamentos 2.6–3.2 cm de largo hacia el ápice, anteras dorsifijas, más anchas que largas, 0.4–0.6 mm de largo, 0.4–0.6 mm de ancho, el conectivo amplio, casi tan grande como las tecas y separando a éstas una de la otra, las tecas dehiscentes por hendiduras anchas longitudinales; poliades discoide, rojizas; ovario apocárpico, glabro; carpelos 5, sub-cilíndricos, erectos, 2.8–3.2 mm de largo, 0.4–0.5 mm de diám., diminutamente pubérulos, cada carpelo con placentación parietal, los óvulos 20, en 2 series de 10, los estilos filiformes, 5.5–6.8 cm de largo, el estigma cupuliforme, 0.2–0.4 mm de diám. Fruto no visto.

Distribución. Conocida solamente de la cuenca amazónica peruana cerca de Iquitos, en bosques húmedos no inundables, 128–140 m.

Etimología. Se dedica esta especie a Roy E. Gereau, del Missouri Botanical Garden, quien nos ha facilitado la identificación de muchas Mimosoideae, y tiene interés especial en *Inga* y otros relacionados.

Comentarios. Affonsea gereauana tiene parentesco con *A. densiflora* Bentham, de la cual se separa fácilmente por sus pecíolos más cortos, estigma cupuliforme, folíolos y flores más grandes, finalmente por su corola y carpelos pubérulos. Esta especie es la primera conocida del Perú y la primera fuera del Brasil oriental.

Parátipos. PERU. **Loreto:** Prov. Maynas, Allpahuayo, Estación Experimental del Instituto de Investigaciones de la Amazonía Peruana, 04°108′S, 73°30′W, 128 m, 8 Sep. 1989 (fl), *C. Grández & A. Sarmiento 1377* (AMAZ, F, G, MO, NY, P, US, USM); Caserío Mishana, Río Nanay, Campamento No. 1, 03°50′S, 73°30′W, 140 m, 19 Nov. 1981 (fl), *J. Ruíz & N. Murphy 208* (AMAZ, F, GH, MO, US, USM).

Agradecimientos. Nuestras investigaciones en la diversidad vegetal amazónica han sido subvencionadas por la John D. and Catherine T. MacArthur Foundation, a quien debemos nuestros sinceros agradecimientos. También agradecemos a Roy Gereau por haber leído el manuscrito y haber hecho valiosas sugerencias.

Literatura Citada

Hutchinson, J. 1964. The Genera of Flowering Plants. Vol. 1. Oxford Univ. Press, Oxford.

Nielsen, I. 1981. Ingeae. Pp. 173–190 *in* R. Polhill & P. Raven (editores), Advances in Legume Systematics, Part I. Royal Botanic Gardens, Kew.

Cyclopogon dressleri (Orchidaceae), a New Orchid Species from Panama

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ABSTRACT. A new species of *Cyclopogon*, *C. dressleri* Szlachetko from Panama, is described as new. It differs from the closely related *C. ovalifolium* Presl in having a fleshy winged isthmus and hornlike appendices on the basal lip auricles.

The genus *Cyclopogon* Presl embraces two subgenera, *Cyclopogon* and *Beadlea* (Smith) Szlachetko, which differ from each other by the absence or presence of the basal union between sepals, respectively. The subgenus *Cyclopogon* contains only one species, *C. ovalifolium* Presl, native to the Andes of Colombia, Ecuador, and Peru. While studying herbarium materials of the subtribe Spiranthinae deposited at FLAS, I found a new species of the subgenus. It is described here as follows.

Cyclopogon dressleri Szlachetko, sp. nov. TYPE: Panama. Coclé: upper Río Blanco, NW of El Copé (Caribbean slope), 600–800 m, *Dressler 5986* (holotype, FLAS). Figure 1.

Cyclopogon ovalifolii similis, sed recedit auriculis labelli processibus carnosis, cornubovariformibus et isthmo distincte alato, alis valde incrassatis, ad nervo primario labelli declinatis et canalis formantes.

Roots 1–1.5 mm diam., fleshy, clustered. Stem 240–280 mm tall, erect, delicate, above ⅓–⅔ glandular. Leaves 8, forming a basal rosette, petiolate; petiole up to 50 mm long, narrow; blade up to 50 mm long, 28 mm wide, sagittate, acute. Cauline bracts 4–5, herbaceous, acute, glabrous, adnate to the stem, slightly shorter than internodes. Inflorescence 60–80 mm long, 10–15-flowered, dense or lax. Flowers rather small, slightly pendent, glabrous, green with white tips. Floral bracts 8 mm long, lanceolate, acute, membranous, herbaceous, glabrous, single-nerved. Pedicel 1 mm long. Ovary ca. 7 mm long. Sepals connate to each other to ⅕ of their length, thin with thickened tips, single-nerved. Dorsal sepal 8.5 mm long, 1.2 mm wide, oblong-lanceolate, subobtuse. Lateral sepals 10.5 mm long, 1.4 mm wide, oblong, obtuse. Petals 7.5 mm long, 1 mm wide, oblong or linear, obtuse, thickened at apices, single-nerved. Lip on distinct claw, adnate to the sepaline tube; hypochile 6.5 mm long, 2.5 mm wide, narrowly obovate, thin at the base, thickening toward the concave center, with basal lip auricles ornamented by hornlike, fleshy appendices; isthmus 1.2 mm long, 2.2 mm wide, broadly winged, wings fleshy, in natural position bent inward, midvein thickened, papillate; epichile 2 mm long, 4 mm wide, elliptical, shallowly 4-lobed, fleshy, papillate. Column 5 mm long; column foot 1.5 mm long, adnate to the ovary. Anther 2.2 mm long. Rostellum 1.5 mm long, rostellum after removal of viscidium 1.3 mm long, shortly 3-dentate, side teeth with margins bent outward.

Cyclopogon dressleri Szlachetko differs from the closely related *C. ovalifolium* Presl in the lip form. In the former species the lip auricles are ornamented by fleshy hornlike appendices, whereas in the latter one there are no calli on the basal lip lobules. The isthmus of *C. dressleri* extends into two fleshy, suborbicular wings on each side. In natural position they are bent toward the middle vein forming a kind of channel. The shallow rounded isthmus of *C. ovalifolium* is not thickened on the margins.

This new species is named for Robert L. Dressler, who first collected it.

Acknowledgments. I am grateful to the curator of FLAS for the loan of herbarium materials and to Ryszard Ochyra for translating the diagnosis into Latin.

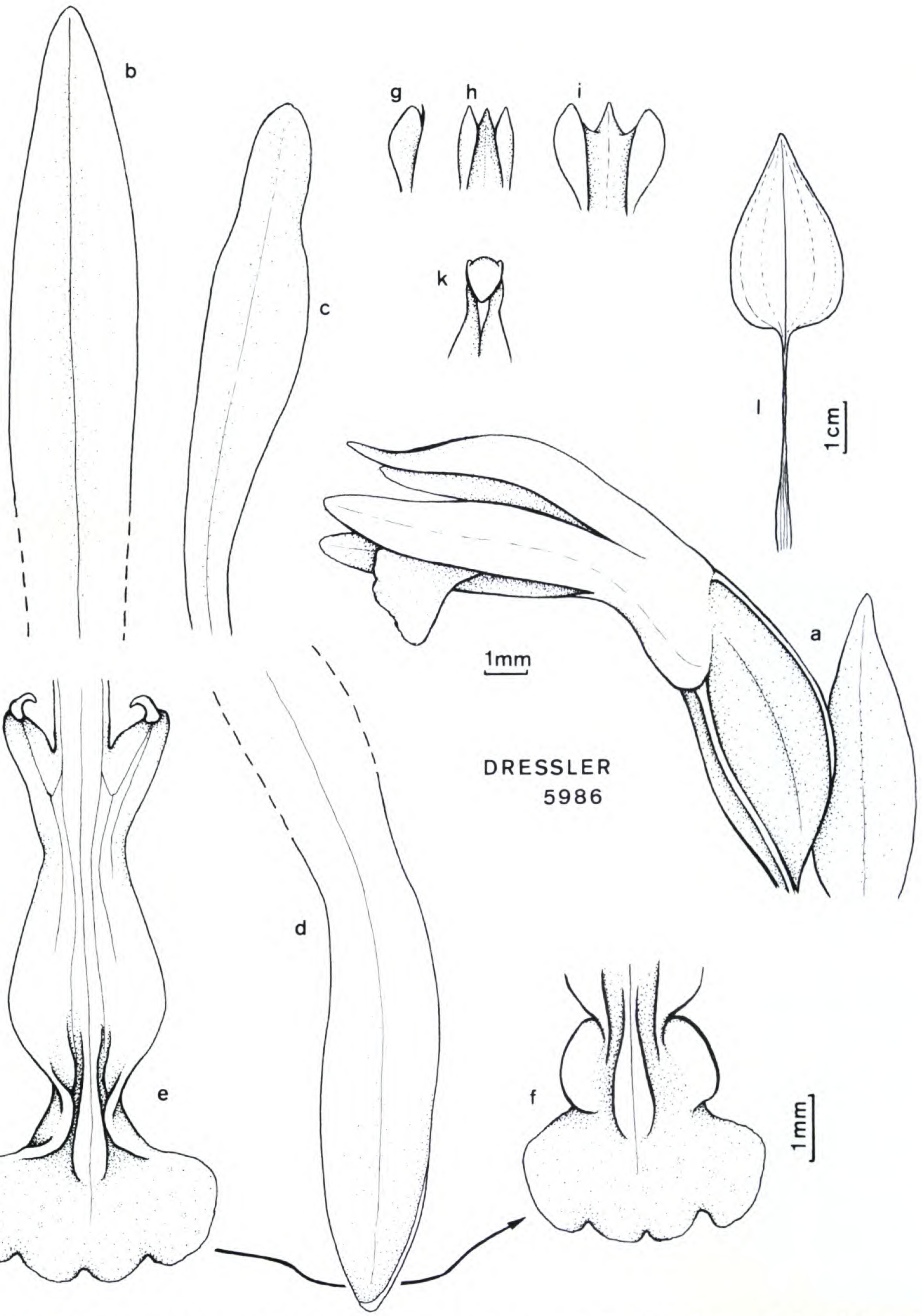

Figure 1. *Cyclopogon dressleri* Szlachetko. —a. Flower and bract. —b. Dorsal sepal. —c. Petal. —d. Lateral sepal. —e. Lip. —f. Apical part of lip, spread. —g. Rostellum remnant, side view. —h. Rostellum remnant, dorsal view. —i. Rostellum remnant spread, dorsal view. —k. Apical part of pollinarium. —l. Leaf. (Drawn from the holotype.)

Three New Species of *Psychotria* subg. *Heteropsychotria* (Rubiaceae) from Western Amazonia

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ABSTRACT. Three previously undescribed species from western Amazonia, described and illustrated here, are: *Psychotria huampamiensis* C. M. Taylor, previously confused with *P. acuminata* Bentham; and *P. cenepensis* C. M. Taylor and *P. ownbeyi* Standley ex C. M. Taylor, both previously confused with *P. zevallosii* C. M. Taylor.

The pantropical genus *Psychotria* L. (Rubiaceae: Psychotrieae) comprises at least 1,000 species. It is represented in the Neotropics by at least 500 species; its representation in this region has been outlined elsewhere (Taylor & Lorence, 1992; Taylor et al., 1991).

The species described below all belong to subgenus *Heteropsychotria* Steyermark. The extensive sectional- and series-level classification that Steyermark (1972, 1974) used within this subgenus was applied only to species found in Venezuela and the Guyana Highlands. Except in a few cases, this classification cannot be extended to these new species until this group is studied in more detail throughout its range.

The following new species were discovered during review of western South American Rubiaceae for preparation of a species list for Peru (Brako & Zarucchi, 1993).

Psychotria huampamiensis C. M. Taylor, sp. nov. TYPE: Peru. Loreto: prov. Alto Amazonas, Andoas, margen izquierda del río Pastaza, Campamento OXI, 2°55′S, 76°25′W, 4 June 1981, *R. Vásquez & N. Jaramillo 1896* (holotype, MO; isotypes, AMAZ not seen, USM not seen). Figure 1.

Psychotriae acuminatae Bentham similis, a qua inflorescentia spiciformi differt.

Shrubs or small trees to 6 m tall, stems to 3 cm DBH, minutely puberulent to glabrescent. Leaves paired, with blades (11)12.5–30 cm long, (3.5)6.5–13 cm wide, 1.8–2.5(3.1) times as long as wide, elliptic, at apex acuminate with slender tip (1)1.5–2 cm long, at base acute, membranaceous to thinly chartaceous, above shiny, above and below glabrescent to minutely puberulous to usually more densely so on costa and secondary and sometimes tertiary veins, abaxially frequently with a line of pilosulous pubescence along sides of costa; secondary veins 10–16 pairs, spreading, usually looping to connect at least in distal half of blade, occasionally with shallow foveolae and frequently barbate in vein axils, with costa, secondary veins, and sometimes also tertiary venation prominulous above and below, with 1(2) weak intersecondary veins usually present between pairs of secondary veins; petioles 0.8–2.5 cm long, sparsely to moderately puberulous; stipules sparsely to densely puberulous, united around the stem into a continuous sheath 1–2(3) mm long, with lobes deltoid to triangular, (1.5)3–5 mm long, acute. Inflorescences terminal, spiciform, narrowly cylindrical; panicles 5–10 cm long, 1.5–2.5 cm wide, (2.5)3.3–6.7 times as long as wide, with flowers in open to strongly congested cymules of 3–11 on short stout lateral branches; peduncles 8–25 mm long; bracts 0.5–1.5 mm long, triangular to deltoid, acute to rounded, frequently caducous after anthesis, without bracteoles; pedicels 0–3 mm long; peduncle, axis, branches, bracts, and pedicels green, moderately and minutely puberulous; flowers with calyx green, moderately to densely puberulous, hypanthium turbinate, ca. 0.8 mm long, limb 0.5–0.6 mm long, lobed for ca. ½ its length, lobes deltoid, acute; corolla slenderly infundibular, white, externally papillose to puberulous, membranaceous, strongly bent at base and curved in tube, internally glabrous except for a densely pilose zone at the stamen attachment; tube 6 mm long; lobes 1.5–1.8 mm long, ligulate, acute, spreading to recurved at anthesis; stamens in long-styled form 1.5 mm long, included; stigmas in long-styled form slightly exserted, 0.5–0.6 mm long; disk annular or slit on one side, ca. 0.5 mm high. Infructescences similar in size and proportion to inflorescences, becoming red to red-purple; fruit 3–3.5 mm long, 5.5–6 mm wide, strongly didymous, the lobes subglobose, glabrate, blue; pyrenes smooth. Collected in flower in April, in fruit February–June, September, and November.

Habitat and distribution. In wet, usually primary forest at 125–500 m, Amazonian Colombia to northern Peru.

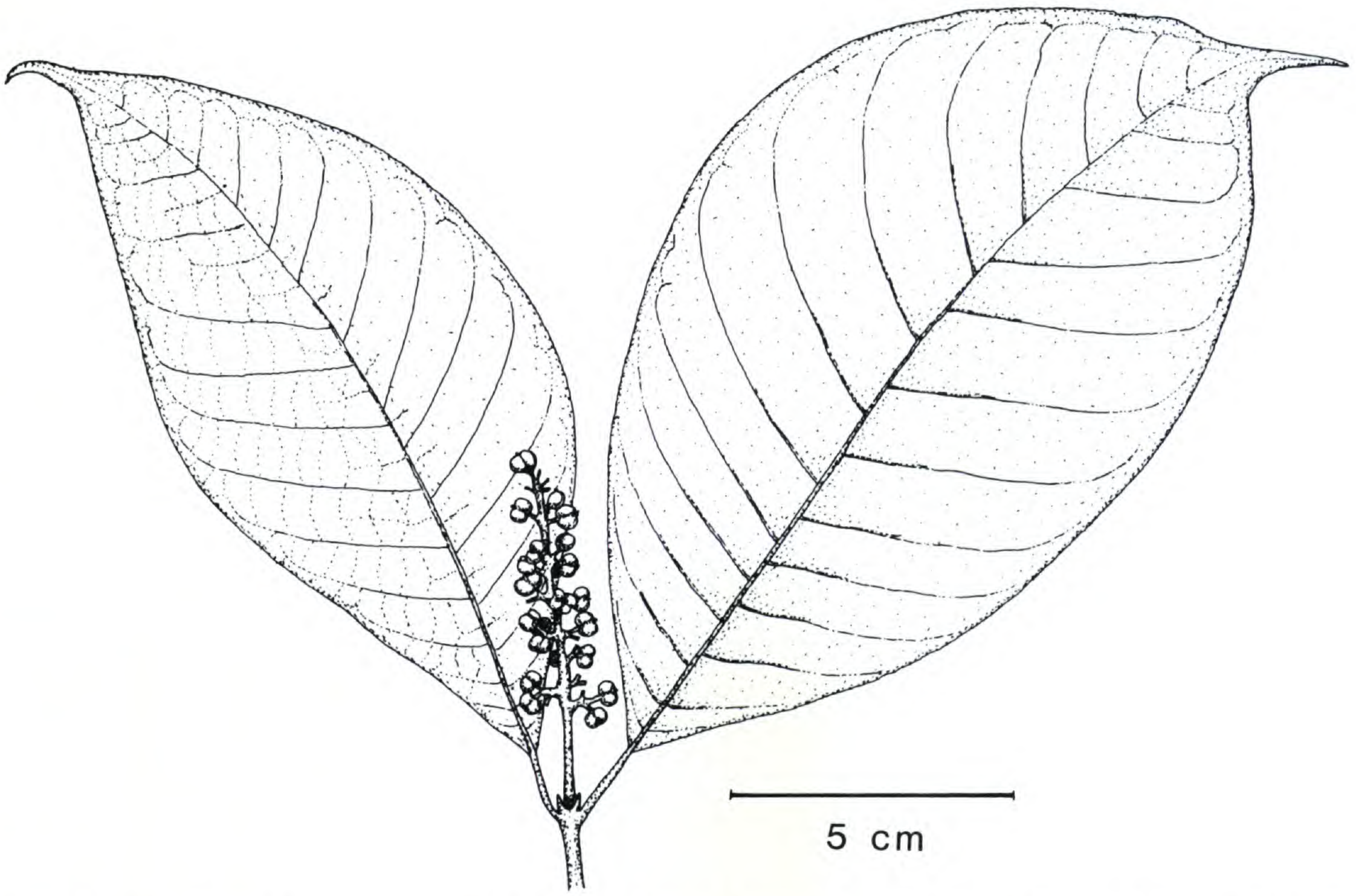

Figure 1. *Psychotria huampamiensis* C. M. Taylor, habit of fruiting plant; based on *Vásquez & Jaramillo 1896* (MO).

This new species is distinguished by its thin-textured shiny leaves that are abruptly acuminate at the apex, narrow spiciform inflorescences, and strongly didymous fruits with smooth pyrenes. In leaf, floral, and fruiting characters it is similar to *Psychotria acuminata* Bentham and *P. compta* Standley, with which it has been confused and with which it seems best classified in section *Didymocarpos* Steyermark. This new species is also similar in general aspect to *P. spiciflora* Standley; this last species can be distinguished by its thicker-textured leaves 3.5–10.5 cm wide that are usually not shiny, strongly thickened inflorescence axis, sessile flowers, and pyrenes with low but evident longitudinal ridges.

Berlin and collaborators report that the plant is locally called "nagkunuk," "nánkunuk," "shawairua kumpari," or "skuitugken." The specific epithet refers to their study area on the Quebrada Huampami, where this species appears to be frequent.

Paratypes. COLOMBIA. **Amazonas:** río Putumayo, carretera entre Caucayá (Puerto Leguizamo) y La Tagua, *Schultes 3742* (MO); municipio Leticia, Parque Nacional Natural Amacayacu, *Rueda 477* (COL, MO). **Caquetá:** carretera entre Puerto Rico y San Vicente del Caguán, Hacienda Las Palmas, *Cabrera 3646* (F). ECUADOR. **Napo:** Río Yasuni, ca. 60 km upriver from Nuevo Rocafuerte, *Foster 3619* (MO, S). **Pastaza:** río Curaray, alrededores de la laguna Garzayacu, 1°29′S, 76°39′W, *Neill & Palacios 6713* (MO, QCNE). PERU. **Amazonas:** Quebrada Huampami, lugar Tseasim, *Ancuash 150* (MO, USM); Quebrada Kayamas, Río Cenepa, *Ancuash 370* (MO, USM); Río Cenepa, vicinity of Huampami, ca. 5 km E of Chávez Valdivia, 4°30′S, 78°30′W, *Ancuash 1379* (F); near Shaim above Quebrada Nahim, 1 day's walk from Huampami to Río Cenepa, *Berlin 436* (MO, USM); vicinity of Quebrada Shimpunts, upper Río Cenepa, *Berlin 899* (MO, USM); valle del Río Santiago, ca. 65 km al N de Pinglo, Quebrada Caterpiza, 2–3 km atras de la comunidad de Caterpiza, *Huashikat 1943* (MO, USM), *2314* (MO, USM); Quebrada Etseketai, Río Cenepa, *Kayap 862* (MO, USM); Quebrada Huampami, Río Cenepa, *Kayap 899* (MO, USM). **Loreto:** Río Corrientes, upriver from Teniente López oil camp, *Gentry et al. 18958* (MO).

Psychotria cenepensis C. M. Taylor, sp. nov. TYPE: Peru. Amazonas: a 1 km de La Poza, banda este del río Santiago, 24 Aug. 1979, *V. Huashikat 178* (holotype, MO; isotype, USM not seen). Figure 2A, B.

Psychotriae zevallosii C. M. Taylor, *P. oleandrellae* (Standley) C. M. Taylor atque *P. ownbeyi* Standley ex C. M. Taylor similis, a quibis inflorescentia subsessili vagina stipularia phylla subtenta differt.

Shrubs or small trees to 5 m tall, glabrous throughout. Leaves paired, with blades 4–11.5 cm long, 1.5–3.5 cm wide, 1.6–4 times as long as wide,

elliptic to elliptic-oblong or somewhat oblanceolate, at apex acuminate with slender tip 1–1.5 cm long, at base acute, membranaceous to somewhat chartaceous, glabrous or abaxially sometimes with a line of pilosulous pubescence along the sides of the costa and secondary veins; secondary veins 11–13 pairs, spreading, curved, extending to and uniting with the cartilaginous margin, without foveolae, the costa prominulous adaxially, the costa, secondary veins, and sometimes the tertiary venation prominulous abaxially, with 1–3 intersecondary veins present between pairs of secondary veins; petioles 3–12 mm long, glabrous; stipules united around the stem into a continuous sheath 0.8–2 mm long and frequently ciliolate, with lobes 2, 0.5–3 mm long, aristate. Inflorescences terminal, densely congested, narrowly cylindrical, solitary, 1–1.5 cm long and in diameter, with ca. 3–7 flowers, sessile or with peduncles to 3 mm long, subtended by a leafless stipular sheath 2–3 mm long with 2 aristate lobes 1–3 mm long or this sometimes with rudimentary leaves to 1 cm long; bracts membranaceous to somewhat chartaceous, glabrous, yellow, the sheathing bracts 4–8, 8–12 mm long, 4–8 mm wide, oblanceolate to pandurate, truncate to rounded or auriculate at base, obtuse to rounded at apex, ciliolate, the floral bracts ca. 6–15, 8–10 mm long, 1–2 mm wide, narrowly ligulate to linear, acute at base and apex, ciliate; flowers with calyx glabrous, the limb 4.5–8 mm long, divided for half to all its length, the lobes narrowly triangular, acute, ciliolate; corollas not seen. Infructescences obovoid to hemispherical, 1–2 cm long, 2–2.5 cm wide, 0.8–0.5 times as long as wide, pale yellow; fruit 5–8 mm long, 5–9 mm wide, ellipsoid, slightly flattened laterally, orange to red; pyrenes with 4–5 longitudinal, rather sharp ridges. Collected in flower February, July, and November to December, in fruit January and July to August.

Habitat and distribution. In wet, usually primary forest at 180–300 m on the lower eastern slopes of the Cordillera del Cóndor in northern Peru.

This new species is distinguished by its leaves with relatively long slender tips and secondary veins that extend to and unite with the cartilaginous margin, small subtruncate stipules with two aristate lobes, capitate inflorescences subtended by generally leafless stipule sheaths, oblanceolate to pandurate yellow sheathing inflorescence bracts, a relatively long calyx limb, and fruit becoming orange to red. In spite of the red rather than blue-black fruit, the placement of this species in subgenus *Heteropsychotria* is supported by its persistent stipules that are biaristate and united around the stem, and green color when dry. It is not uncommon for the developing fruit of species of this subgenus to pass through a red or orange stage before becoming blue-black, and the mature fruit of this species may not have been seen by its collectors.

This new species is similar to *Psychotria oleandrella* and *P. zevallosii* (*Cephaëlis williamsii* Standley), both of which can be distinguished by their pedunculate inflorescences that are not subtended by a leafless stipular sheath, lanceolate to ovate sheathing inflorescence bracts, and calyx limbs to 2 mm long. *Psychotria ownbeyi*, described below, is also similar but can be distinguished by its pilosulous to puberulous pubescence, glandular-fimbriate and usually bifurcate to multifid stipular lobes, inflorescences not subtended by a leafless stipular sheath, and smooth pyrenes. *Psychotria cenepensis* has been confused with *P. flaviflora* (K. Krause) C. M. Taylor (*Cephaëlis flaviflora* K. Krause), which has pedunculate inflorescences that are not subtended by a leafless extra stipular sheath and rounded to deltoid stipules that lack well-developed aristae.

Berlin and his colleagues report that this plant is locally called "samikua," but has no practical use. The specific epithet refers to their study area on the Río Cenepa, where this species appears to be frequent.

Paratypes. PERU. **Amazonas:** Quebrada Wampusik entsa, *Ancuash 734* (MO, USM); Río Cenepa, vicinity of Huampami, ca. 5 km E of Chávez Valdivia, 4°30′S, 78°30′W, al lado de Padre Carlos, parte de Kayamas entsa, *Ancuash 1058* (F, MO, USM), *1253* (MO, USM), *Kujikat 52* (MO, USM); between Cenepa and Kayamas, *Berlin 515* (F, MO, USM); trail above Quebrada Cikanicito Shimpuntz, W of Huampami, *Berlin 623* (MO, USM); S of Aintami Creek, E of Río Cenepa, *Berlin 1583* (F, MO, USM); S of Huampami, trail to house of Theodora, S of Río Cenepa, *Berlin 1667* (F, MO, USM); Mobil Oil Co. trail, 2–3 km from La Poza, E bank of Santiago River, *Berlin 3507* (MO, USM), *Leveau 94* (MO); next to Río Cenepa above mouth of Quebrada Huampami, *Kayap 44* (F, MO); frente a la comunidad de Galilea, banda este del río Santiago, *Huashikat 64* (F, MO), *Leveau 220* (MO); camino de Jutui entsa, *Kayap 1376* (F, MO, USM); atrás de la casa de Jaime Braga, banda este, río Santiago, *Leveau 67* (MO).

Psychotria ownbeyi Standley ex C. M. Taylor, sp. nov. TYPE: Ecuador. Napo: Cantón Archidona, S slopes of Volcán Sumaco, 4 km N of Huahua Sumaco community near Río Huataraco, 00°43′S, 77°32′W, 13 Dec. 1989, *D. Neill, A. Alvarado & F. Hurtado 9164* (holotype, MO; isotype, QCNE not seen). Figure 2C, D.

Psychotriae cenepensi C. M. Taylor similis, a qua foliorum minorum apicibus brevioribus, stipulis glandulari-fimbriati setiam inflorescentia vagina stipulari aphylla non subtenta differt.

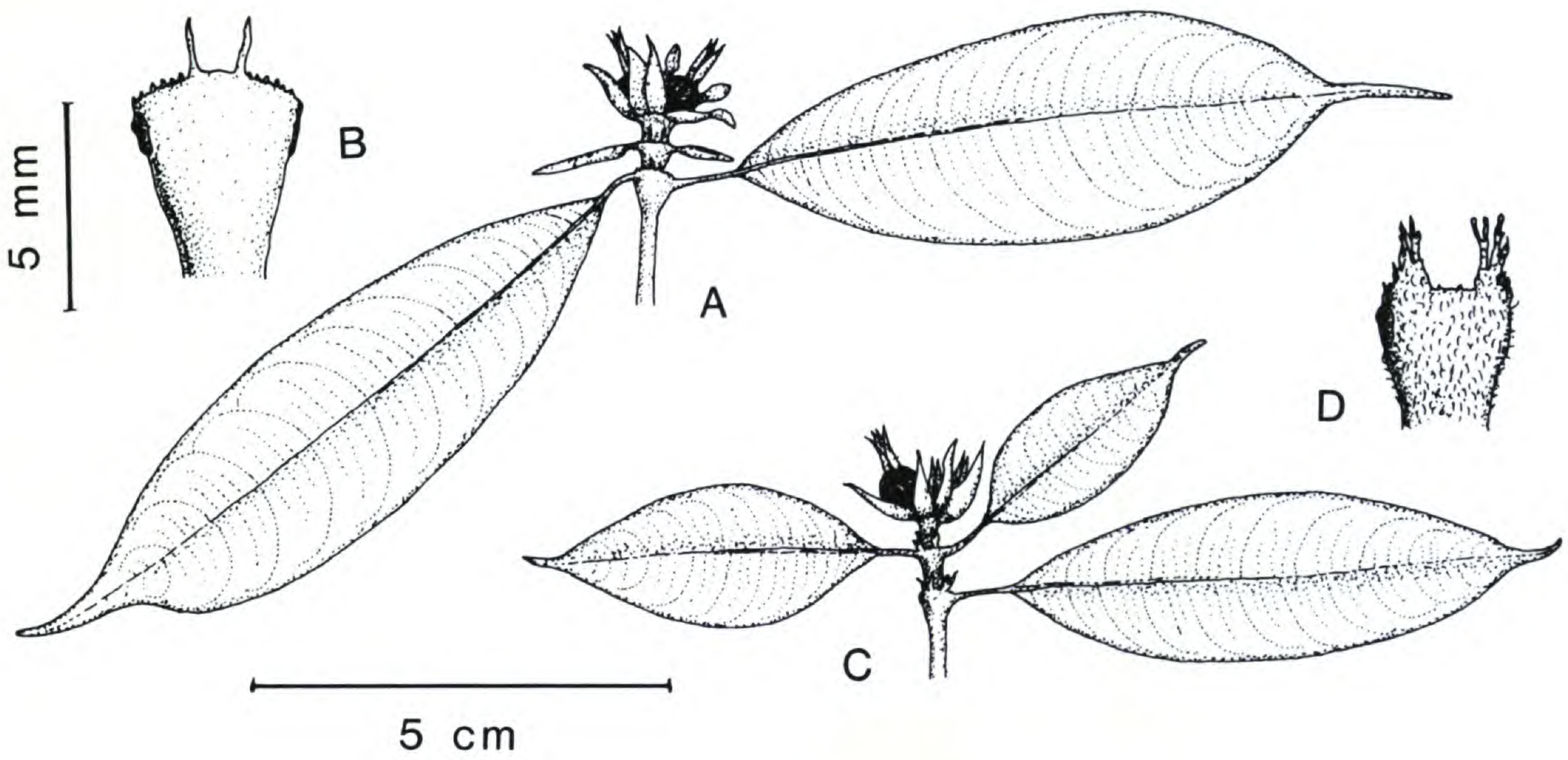

Figure 2. A, B, *Psychotria cenepensis* C. M. Taylor. —A. Habit of fruiting plant; based on *Berlin 1583* (MO). —B. Stipule; based on *Ancuash 1058* (MO). C, D, *Psychotria ownbeyi* Standley ex C. M. Taylor; based on *Flynn et al. 4016* (MO). —C. Habit of fruiting plant. —D. Stipule. A, C to 5-cm scale; B, D to 5-mm scale.

Shrubs or small trees to 5 m tall, stems puberulous to pilosulous. Leaves paired, with blades 3.5–11 cm long, 1.3–3.6 cm wide, 2.1–4 times as long as wide, narrowly elliptic to elliptic or elliptic-oblong, at apex acute or sometimes acuminate with the tip ca. 5 mm long, at base acute to cuneate, chartaceous, glabrescent or frequently pilosulous abaxially and the costa and secondary veins usually pilosulous at least abaxially; secondary veins 10–23 pairs, spreading, broadly curved, extending to and uniting with the cartilaginous margin, without foveolae, the costa prominulous abaxially and sometimes also adaxially, the secondary veins smooth or occasionally thickened abaxially, with 3–7 intersecondary veins present between pairs of secondary veins, with 1–3 of these well developed and resembling secondary veins but not extending to margin; petioles 2–9 mm long, pilosulous; stipules puberulous to pilosulous, united around the stem into a continuous sheath 1–3 mm long and ciliolate and frequently slightly to densely fimbriate, with lobes 2, 1–2 mm long, narrowly triangular to linear, usually bifurcate to multifid for ca. half their length, sparsely to densely fimbriate, with fimbriae 0.5–23 mm long, usually glandular at apex. Inflorescences terminal, densely congested, ovoid to narrowly cylindrical, solitary, 9–15 mm long, 8–10 mm diam., 1.1–1.5 times as long as wide, with ca. 3–5 flowers, with stout peduncles 1–4 mm long, the subtending stipular sheath usually relatively longer than the vegetative ones though bearing leaf blades generally similar in size to those of vegetative nodes; bracts 6–10, chartaceous, pilosulous, pale green to white, cream, or pale yellow, 6.5–12 mm long, 3–5 mm wide, lanceolate to somewhat pandurate, acute at apex, ciliate; flowers with calyx puberulous to pilosulous, the limb 5–6 mm long, divided for ca. half its length, the lobes very narrowly triangular, acute, ciliolate; corollas white to cream, funnelform, glabrous, the tube 6–10 mm long, the lobes 1.2–2 mm long, triangular, entire or sometimes with an apical knobbed appendage ca. 0.5 mm long. Infructescences similar to inflorescences; fruit 3–5 mm long, 4.5–6 mm wide, ellipsoid to ovoid, flattened laterally, red-orange becoming black; pyrenes smooth. Collected in flower September to January, in fruit March, May, June, October, and December.

Habitat and distribution. Locally frequent at 400–1,400 m in wet primary forest of the western Amazon basin from Ecuador and adjacent Colombia to northern Peru.

This new species is distinguished by its leaves with secondary veins that extend to and unite with the cartilaginous margin, small stipules with glandular-fimbriate and frequently bifurcate lobes, relatively long calyx limb, smooth pyrenes, and puberulous to pilosulous pubescence on all parts. It is similar to *Psychotria cenepensis;* their distinctions are summarized under that species, above.

Flowering branches bear generally smaller leaves with fewer secondary veins and less densely fimbriate stipular lobes than non-flowering branches.

Standley (in herb.) proposed the specific epithet

in honor of Marion Ownbey, who collected some of the first material of this species. However, he never published this name.

Paratypes. COLOMBIA. **Putumayo:** márgenes del río Guamés 4 km al S de San Antonio del Guamés, *Foster 1545* (F). ECUADOR. **Morona–Santiago:** Río Encanto near junction with the Río Pastaza, *Steere & Camp 8237* (F). **Napo:** Cantón Tena, Estación Biológica Jatun Sacha, ca. 8 km ESE of Puerto Misahuallí, 1°04′S, 77°37′W, *Cerón 622* (MO), *Cerón & Igaugo 5542* (MO), *Cerón & Montesdeoca 8010* (MO), *Flynn et al. 4016* (F, MO, QCNE), *Miller et al. 2242* (MO), *Palacios & Neill 916* (MO, QCNE), *Palacios 3278* (MO), *Stein & Suárez 3040* (MO); Río Napo, 2 km río abajo de Campana Cocha, boca del Río Huambuno, 1°01′S, 77°30′W, *Neill & Marles 6999* (MO, QCNE); Cantón Archidona, faldas al sur del Volcán Sumaco, comuna Huahua Sumaco, Km 50 de la carretera Hollín–Loreto, 0°43′S, 77°34′W, *Hurtado et al. 2100* (MO, QCNE), Km 45, 0°44′S, 77°35′W, *Hurtado et al. 2779* (MO, QCNE); ridge NW of crossing of Río Shitiyacu on trail from Archidona to headwaters of Río Tena, *Ownbey 2727* (F, MO); vía Hollín–Loreto, a 3 km después del río Hollín, 00°52′S, 77°43′W, *Palacios 3849* (MO, QCNE); Cantón El Chaco, Río Granadillo, campamento de INECEL "Codo Alto," 00°08′S, 77°28′W, *Palacios 5551* (MO, QCNE). **Pastaza:** Cantón Pastaza, pozo petrolero "Moretecocha" de Arco, 75 km al este de Puyo, 1°34′S, 77°25′W, *Gudiño et al. 989* (MO), *1153* (MO); Mera, *Harling et al. 10132* (MO). **Zamora–Chinchipe:** Cantón Nangaritza, Río Nangaritza, Miazi, 4°18′S, 78°40′W, *Neill 9641* (MO, QCNE). PERU. **Cuzco:** Prov. Quizpichanchi, Camanti, Miniri, en el cerro Caminti, 13°17′S, 70°48′W, *Timaná 1070* (CUZ, MO).

Acknowledgments. I thank the Field Museum of Natural History for making specimens available, Roy E. Gereau for help preparing the Latin diagnoses, and two anonymous reviewers for helpful suggestions.

Literature Cited

Brako, L. & J. L. Zarucchi. 1993. Catalogue of the Flowering Plants and Gymnosperms of Peru. Monogr. Syst. Bot. Missouri Bot. Gard. 45.

Steyermark, J. A. 1972. *Psychotria*. *In:* B. Maguire & Collaborators, Flora of the Guayana Highlands. Mem. New York Bot. Gard. 23: 406–717.

———. 1974. Rubiaceae: *Psychotria*. *In:* T. Lasser (editor), Flora de Venezuela 9(3): 1111–1683. Instituto Botánico, Dirección de Recursos Naturales Renovables, Ministerio de Agricultura y Cría. Caracas, Venezuela.

Taylor, C. M. & D. Lorence. 1992. Notes on *Psychotria* subgenus *Heteropsychotria* (Rubiaceae: Psychotrieae) in Mexico and northern Central America. Novon 2: 259–266.

———, B. E. Hammel & W. Burger. 1991. New species, combinations, and records in Rubiaceae from the La Selva Biological Station, Costa Rica. Selbyana 12: 134–140.

A New Species of *Bouvardia* (Rubiaceae) from Mexico, and Transfer of *Hedyotis xestosperma* to *Bouvardia*

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ABSTRACT. *Bouvardia rzedowskii*, a new species from Oaxaca and Guerrero, Mexico, is described. We also note the rediscovery of the rare Oaxacan endemic *Hedyotis xestosperma* and transfer it to *Bouvardia*.

Among specimens lent several years ago to Terrell from Mexican herbaria were two collections by Jerzy Rzedowski and one by David Lorence of an unknown *Bouvardia* from a locality in northwestern Oaxaca. The collections had been identified as *Oldenlandia xestosperma* Robinson & Greenman or *Houstonia xestosperma* (Robinson & Greenman) Terrell, a rare Oaxacan endemic that is similar to the unknown *Bouvardia*.

During a 1987 trip to study *Houstonia* and related genera we collected the *Bouvardia* at its only then-known locality in Oaxaca, and one of us (Koch) also rediscovered *Hedyotis xestosperma*, previously known only from four old collections. Here we describe the unknown *Bouvardia* and transfer *Hedyotis xestosperma* to *Bouvardia*.

Bouvardia rzedowskii Terrell & S. D. Koch, sp. nov. TYPE: Mexico. Oaxaca: Ladera caliza con vegetación de encinar, alt. 2,300 m, 6 km al SW de Tamazulapan, sobre la carretera a Chilapa, 12 Aug. 1977, *J. Rzedowski 35142* (holotype, ENCB; isotypes, ARIZ, ASU, MICH, XAL). Figure 1.

Herba perennis rhizomata; folia opposita linearia; inflorescentia parva, cymis paucifloris; corolla 6–12 mm longa, late tubiformis, rubra vel scarlatina, cum vel sine lineas luteas vel aurantiacas vittata, tubo 5–11 mm longo; semina 1.2–1.6 mm diametro, complanata, suborbicularia, anguste alata.

Perennial herbs with a semiwoody oblique or horizontal rhizome to 5 mm thick. Stems 15–50 cm tall, slender, erect, terete, internodes densely and minutely puberulent, simple or sparsely branched. Leaves 2–8 cm long, 0.5–2 mm wide, opposite, sessile, linear, thickish, glabrous, apices sharply acute. Stipules 1–6 mm long, greenish, narrowly lanceolate to subtriangular, puberulent or glabrous, apices acute, acuminate, caudate, bifid, or toothed, sometimes with colleters. Inflorescence of heterostylous flowers in small few-flowered terminal cymes, pedicels 0.5–5 mm long, erect, slender, puberulent. Calyces 4–6-lobed; lobes 0.5–3 mm long, 0.3–0.5 mm wide, subtriangular to narrowly lanceolate, acute, glabrate, puberulent or pubescent. Corollas 4–5-lobed, 6–12 mm long, broadly funnelform, red or scarlet externally with or without broad longitudinal yellow or orange bands, yellow or orange within, glabrous externally; tubes 5–11 mm long, 3–6 times longer than the lobes, 1–3 mm wide at base, 2.5–7 mm wide at throat, basal ¼–½ of tube densely pubescent within with hairs to 0.8 mm long, median and distal parts of the tube glabrous within; lobes 1–5 mm long, 1–4 mm wide, broadly ovate or subtriangular, obtuse, somewhat incurved, connivent, not spreading or reflexed, glabrous within. Anthers 4–5, 1–3 mm long, 0.3–0.4 mm wide, linear, sessile or on filaments to 0.5 mm long. Stigmas with 2 linear lobes 1.5–2.5 mm long. Pin flowers with stigmas located in distal part of corolla tube or slightly exserted; anthers included, located at ¼–⅓ of the distance from the corolla tube base. Thrum flowers with anthers included, located at ½–¾ of the distance from the corolla tube base; stigmas included, located at ⅓–¼ of the distance from the corolla tube base. Capsules 3–5 mm long, 3.5–4.5 mm wide, subglobose, ⅘ to almost fully inferior, thick-walled, glabrous. Seeds 1.2–1.6 mm diam., black or brown, strongly compressed, flat or concavo-convex, suborbicular in outline, ventral face with thickened hilar area near center of seed, hilum punctiform, wing 0.1–0.35 mm wide, brown, papery, fragile, surrounding all or most of seed, testa finely reticulate, with minute radial striae from the hilum. Chromosome number unknown.

Distribution. Bouvardia rzedowskii occurs in northwestern Oaxaca and adjacent western Guerrero at 2,000–2,400 m. The habitat at the type

Figure 1. Isotype (XAL) of *Bouvardia rzedowskii* Terrell & S. D. Koch, with one inflorescence enlarged.

locality is gladelike, with open places interspersed with shrubby oaks in well-drained soil over limestone.

The new species resembles *B. rosea* Schlechtendahl and *B. tenuifolia* Standley in being an herbaceous perennial with linear leaves. Unlike these species, *B. rzedowskii* has opposite rather than 3–6-nate leaves, the latter an important characteristic of subgenus *Bouvardia* in Blackwell's (1968) key to subgenera. *Bouvardia tenuifolia* has externally pubescent corollas that are tubular, red, and 8.5–31 mm long. The species occurs in Jalisco, Sinaloa, and Durango. *Bouvardia rosea* has externally glabrous corollas that are salverform, rose, violet-blue, or pink, and 7.5–25 mm long. This species is known from San Luis Potosí, Guanajuato, Queretaro, and Hidalgo. *Bouvardia rzedowskii* has externally glabrous corollas that are 5–12 mm long, broadly tubular, and red or scarlet with or without yellow or orange longitudinal bands. The flowers are conspicuous and attractive.

With respect to its placement in *Bouvardia* or *Hedyotis*, *B. rzedowskii* has such bouvardioid characteristics as flat, winged seeds, terminal few-flowered cymes, and rather thick-walled capsules that are larger than the usual *Hedyotis* capsules. It also has greenish, narrow, herbaceous stipules in contrast to the usual whitish scarious stipules occurring in *Hedyotis*.

Paratypes. MEXICO. **Oaxaca:** type locality, 3 July 1977, *Rzedowski 34854* (ENCB); Distr. de Teposcolula, ca. 8 km al SO de Tamazulapan, camino a Chilapa, 8 Aug. 1981, *D. H. Lorence et al. 3717* (CAS); Distr. de Teposcolula, 5 km al NO de Tamazulapan, Mexteca Alta, alt. 2,400 m, 25 Aug. 1983, *A. García Mendoza 1242* (ENCB); Mpio. Tamazulapan, 6 km al SO de Tamazulapan, alt. 2,300 m, 16 July 1987, *Koch & Terrell 879* (CAS, CHAPA, IEB, MEXU, MICH, TEX, US), 14 Oct. 1989, *Koch & Koch 8935* (seeds only) (CHAPA); Distr. de Huajuapan, a 23 km al NO de Huajuapan de León, camino a Ciénaga Zahuatlán, 19 Sep. 1982, *M. Sousa S. et al. 5922* (MEXU). **Guerrero:** Mpio. de Xalpatláhuac, 32 km al S de Tlapa, camino a Malinaltepec, alt. 2,240 m, 26 June 1982, *E. Martínez S. 1088* (MEXU); Mpio. de Tlapa, 34 km al S de Olinalá, camino a Tlapa, alt. 2,000 m, 27 June 1982, *E. Martínez S. 1137* (ENCB).

Bouvardia xestosperma (Robinson & Greenman) Terrell & S. D. Koch, comb. nov. Basionym: *Oldenlandia xestosperma* Robinson & Greenman, Proc. Amer. Acad. Arts 32: 41. 1896. *Hedyotis xestosperma* (Robinson & Greenman) W. H. Lewis, Rhodora 63: 222. 1961. *Houstonia xestosperma* (Robinson & Greenman) Terrell, Brittonia 32: 493. 1980. TYPE: Mexico. Oaxaca: open glades, Sierra de San Felipe, 8,000 ft., June 1894, *C. G. Pringle 4692* (lectotype, designated by Terrell (1980), GH; isolectotypes, BM, CM, F, K, MEXU—2, MICH, MO, MSC, PH, US—2, VT).

Distribution. Bouvardia xestosperma is rare in open glades and rather open and cut-over pine or pine-oak forest between 2,000 and 2,700 m. Only the type and three other old collections were known prior to 1987. We were unable to relocate the species at any of the old localities in July 1987, prior to Koch's rediscovery of the species at the two new localities. Besides the type locality, the species is now recorded from five other sites.

Terrell (1980) noted that the specific epithet, "xestosperma," refers to shiny seeds, and these were described by Robinson & Greenman (1896) as yellowish, highly polished, and shiny. The lectotype has an attached packet with small shiny seeds, but these did not come from the lectotype specimens, as they are not hedyotoid and probably not rubiaceous. In October 1989, mature seeds were gathered (*Koch & Koch 8934*) from the population represented by *Koch & Terrell 8730*. Attempts to germinate the seeds were not successful.

Hedyotis xestosperma previously has been considered an anomalous species without any apparent particular resemblances to other Mexican species of *Hedyotis* (Terrell et al., 1986). Terrell (1991) listed it in the genus *Hedyotis*, while noting that *Hedyotis* is a "dustbin genus" and pertains mainly to Asian species. *Hedyotis xestosperma* is very similar to *Bouvardia rzedowskii* in having the following morphology: similar general habit, conspicuous rhizomes, linear leaves, stipule structure, terminal few-flowered cymes, and similar capsule and seed morphology; consequently, we have no hesitation in transferring it to *Bouvardia*. The two species differ as expressed in the following key:

1a. Calyx lobes 0.3–0.5 mm wide; corollas 6–12 mm long, red or scarlet externally with or without longitudinal yellow or orange bands, yellow or orange within; corolla tubes 5–11 mm long, about 3–6 times longer than lobes, basal ¼–½ densely pubescent within; corolla lobes connivent or erect, not spreading or reflexed; pin flowers with stigma lobes located in distal part of corolla tube or slightly exserted; mature capsules 3–5 mm long ..... *Bouvardia rzedowskii*

1b. Calyx lobes 0.5–1 mm wide; corollas 5–10.5 mm long, deep to light pink externally, creamy white within; corolla tubes 4–7.5 mm long, 2–4 times longer than lobes, glabrate within; corolla lobes spreading or reflexed; pin flowers with stigma lobes exserted 1–2 mm beyond corolla throat; mature capsules 2.5–4 mm long ..... *Bouvardia xestosperma*

Additional specimens examined. MEXICO. **Oaxaca:** Cerro de San Felipe, *Conzatti & Gonzalez 248* (GH,

MEXU); Distr. Nochixtlan, Camino Montelobos, Rancho Nopalero, *Conzatti 1853* (F); mountainside in pine land above Tejocote, *Lundell 12291* (LL, MICH); Mpio. San Andrés Nuxiño, 2 km al S de La Carbonera, por la carretera Oaxaca–Izúcar de Matamoros, bosque abierto de pino, suelo arenoso, *Koch & Terrell 8727* (US); Mpio. Sto. Domingo Nuxaa, Terracería a Ojo de Agua, 5 km al S de La Herradura (56 km al NO de Oaxaca), carretera Oaxaca–Izúcar de Matamoros, bosque de pino y encino muy abierto (parcialmente talado), suelo franco-arenoso, *Koch & Terrell 8730* (CHAPA, ENCB, MEXU, XAL), *Koch & Koch 8934* (seeds only) (CHAPA).

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Literature Cited

Blackwell, W. H., Jr. 1968. Revision of *Bouvardia* (Rubiaceae). Ann. Missouri Bot. Gard. 55: 1–30.

Robinson, B. L. & J. M. Greenman. 1896. VI.—Descriptions of new or little known phanerogams, chiefly from Oaxaca. Proc. Amer. Acad. Arts 32: 41–42.

Terrell, E. E. 1980. Two new species and a new combination in *Houstonia* (Rubiaceae) from Mexico. Brittonia 32: 490–494.

———. 1991. Overview and annotated list of North American species of *Hedyotis*, *Houstonia*, *Oldenlandia* (Rubiaceae) and related genera. Phytologia 71: 212–243.

———, W. H. Lewis, H. Robinson & J. W. Nowicke. 1986. Phylogenetic implications of diverse seed types, chromosome numbers, and pollen morphology in *Houstonia* (Rubiaceae). Amer. J. Bot. 73: 103–115.

A New Species of *Zinowiewia* (Celastraceae), and Notes on the Genus in Ecuador

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ABSTRACT. *Zinowiewia* is a small neotropical genus of 17 species. Two species are reported to occur in Ecuador: *Zinowiewia australis* Lundell and the new *Zinowiewia madsenii* C. Ulloa & P. M. Jørgensen. A key to the Ecuadorian species, descriptions, and an illustration of the new species are provided.

Turczaninow (1858) described *Wimmeria integerrima*, questioning its generic position. A year later he recognized this species as belonging to a new distinct neotropical genus, *Zinowiewia* Turczaninow (Turczaninow, 1859). The genus remained monotypic until Lundell (1938) described six new species. The following year he published a revision of the genus containing seven species (Lundell, 1939a), and shortly after he added two new species (Lundell, 1939b, 1940).

Between 1964 and 1988 five species from Mexico and Central America were described (Lundell, 1981, 1985, 1987; Williams, 1964) and two from northern South America (Lundell, 1970; Steyermark, 1988), bringing the number of recognized species to 16.

The genus was recently reported to occur in Ecuador from collections made in the province of Loja (Madsen, 1991; Ulloa Ulloa & Jørgensen, 1993). These collections appeared to represent an undescribed species endemic to a small area of the Podocarpus National Park. Further examination of the specimens deposited at the Missouri Botanical Garden showed the presence of a second species in Ecuador, *Zinowiewia australis* Lundell.

The species of *Zinowiewia* are trees or shrubs characterized by their one-winged samaras, decussate leaves, and one- to several-times forked cymes. The genus is distributed from south-central Mexico through Central America to Peru, from 250 to 3,150 m elevation. At present two distinct species occur in Ecuador.

KEY TO THE SPECIES OF *ZINOWIEWIA* IN ECUADOR

1a. Leaves 4.2–9 cm long, 2–4.5 cm wide, membranaceous to subchartaceous, petioles 6–11 mm long; cymes subsessile, 4- to 6-times forked; samaras 20–28 mm long, 7.5–17 mm wide; Amazonian lowlands ..... *Zinowiewia australis*

1b. Leaves (0.9–)1.8–3(–4.2) cm long, (0.7–)1.4–1.8(–2.3) cm wide, subcoriaceous to coriaceous, petioles 2–4 mm long; cymes on peduncles up to 8 mm long, 1- to 2-times forked; samaras 14–19 mm long, 4–7.5 mm wide; upper Andean forest ..... *Zinowiewia madsenii*

Zinowiewia australis Lundell, Bull. Torrey Bot. Club 65: 469. 1938.

Tree to 40 m high; buttressed; trunk canaliculate; bark fissurate (*Palacios et al. 3528*); branchlets slender. *Leaves* membranaceous to subchartaceous, dark green; petioles deeply canaliculate, 6–11 mm long; leaf blades ovate-elliptic, lanceolate or elliptic, 4.2–9 cm long, 2–4.5 cm wide, apex acuminate to apiculate, base narrowed, acute, decurrent, margin revolute; venation reticulate, midvein impressed above, prominent beneath, the main lateral veins 4–6 on each side, elevated above and beneath. *Inflorescence* a dense cyme on mostly defoliate branches, to 2.4 cm long, forked 4–6 times, subsessile, peduncle up to 1.5 mm long, primary branches up to 7 mm long; bracts and bracteoles up to 0.8 mm long; pedicels of all flowers jointed at or near the base, up to 0.5 mm long below joint. *Flowers* green; calyx lobes 5, 0.3–0.5 mm long, 0.7–0.8 mm wide, widely ovate, slightly 3-lobed, central lobe acute, margin light green, entire; petals 5, 0.9–1.2 mm long, 0.5–0.8 mm wide, lanceolate-ovate, acute to obtuse; stamens 5, filaments 0.6 mm long, borne on angles of disk, anthers 0.2 mm long; disk fleshy, pentagonal, margin slightly elevated; ovary 2-locular, submerged in the disk, 2 ovules in each locule. *Fruits* (from the original description and Peruvian material) broadly oblanceolate to obovate samaras, 20–28 mm long, 7.5–17 mm wide, strongly veined, apex rounded, mucronate; seed 1, 8–11 mm long, 2.5–3 mm diam.

Distribution. Venezuela to Peru, in lowland to submontane forests, 250–1,250 m elevation.

Zinowiewia australis is characterized by its large, dark, thin leaves, long peduncles, subsessile cymes forked 4–6 times, and large obovate samaras.

Figure 1. *Zinowiewia madsenii* C. Ulloa & P. M. Jørgensen. —A. Habit. —B. Inflorescence in bud. —C. Flower. —D. Fruits. Habit and flower based on *Madsen 86233* (AAU), inflorescence based on *Madsen 85826* (AAU), fruits based on *Madsen 86076* (AAU).

Specimens examined. ECUADOR. **Napo:** Vía Coca–Loreto–Hollín, sitio Huaticocha, 00°45′S, 77°29′W, 500–575 m, 11 Jan. 1989 (fl), *Palacios, Iguago & Hurtado 3528* (MO, QCNE), 10 Jan. 1989 (fl), *Hurtado, Palacios & Iguago 1384* (MO, QCNE). PERU. **Pasco:** Oxapampa, Gran Pajonal, ca. Chequitano, 10°45′S, 74°23′W, 1,250 m, 23 Sep. 1983 (fl, fr), *Smith 5178* (MO).

Zinowiewia madsenii C. Ulloa & P. M. Jørgensen, sp. nov. TYPE: Ecuador. Loja: Parque Nacional Podocarpus, E of Nudo de Cajanuma, just N of Centro de Información, sample plot site, wet montane forest, 04°05′S, 79°10′W, 2,900 m, 14 Oct. 1989 (fl, fr), *Madsen 86233* (holotype, AAU). Figure 1.

Zinowiewiae sulphureae Lundell affinis sed petiolis brevioribus, foliis minoribus, nervis lateralibus pauciori-bus, pedicellis brevioribus, disco quinqueangulato, samara 1-seminata differt.

Shrub to trees, to 15 m high, densely branched; branchlets densely foliose, drying brown-red, strongly canaliculate, and angulate. *Leaves* subcoriaceous to coriaceous, darker and lustrous above, opaque below; petioles deeply canaliculate, 2–4 mm long; leaf blades lanceolate-elliptic to ovate-elliptic, (0.9–)1.8–3(–4.2) cm long, (0.7–)1.4–1.8(–2.3) cm wide, apex acute, acumen rounded, base attenuate to cuneate, and decurrent, margin revolute; venation reticulate, midvein impressed above, prominent beneath, the main lateral veins 4–6 on each side, elevated beneath, obscure above. *Inflorescence* a cyme, axillary in the upper leaves, up to 1.3 cm long, forked 1–2 times, peduncle up to 8 mm long, primary branches up to 3 mm long, glabrous to sparsely pubescent; bracts and bracteoles up to 1 mm long; pedicels up to 1.8 mm long below joint, those of terminal flower of cyme jointed below the middle, those of lateral flowers jointed at or below the middle. *Flowers* green; calyx lobes 5, ca. 0.5 mm long, 0.8 mm wide, broadly deltoid, obtuse, margin brown-red, erose; petals 5, 1.2–1.8 mm long, 0.8–1.3 mm wide, oblong-ovate, apex rounded; stamens 5, filaments 0.4 mm long, borne on angles of disk, anthers 0.3 mm long; disk fleshy, pentagonal, margin slightly elevated; ovary 2-locular, submerged in the disk, 2 ovules in each locule. *Fruits* oblong-obovoid samaras, apex rounded to acute, mucronate, 14–19 mm long, 4–7.5 mm wide, light green, midvein prominent, veinlets well developed; seed 1, 4–7 mm long, 1–2 mm diam., straight to slightly curved.

Distribution. Southern Ecuador, in upper montane rainforest, at 2,900–3,150 m elevation.

Zinowiewia madsenii most closely resembles *Z. sulphurea* Lundell from the Andes of Colombia. Both species grow in the same type of habitat, have reddish, grooved, thick branchlets, short internodes, coriaceous leaves with revolute margins, reticulated venation on lower surface, few-times branched cymes, and sepals with erose, reddish margin. The Colombian species differs, however, in having longer lanceolate leaf blades (5–8 cm long), with 6–8 pairs of main lateral nerves, longer petioles (5–8 mm), longer pedicels (up to 3 mm long), annular disk, and 2-seeded samaras.

Zinowiewia madsenii is readily distinguished by its dense foliage of small leaves with very short petioles. Furthermore, the occurrence of cymes 1-forked and sometimes sparsely pubescent is unusual within the genus. One collection (*Madsen 85771*) has an additional infertile branch with herbaceous longer leaves, 6.1 cm long, 2.5 cm wide, that may correspond to a juvenile or a shaded shoot. This species is named after the Danish botanist Jens E. Madsen, the only person who has collected this species and the one who brought this interesting plant to our attention.

Paratypes. ECUADOR. **Loja:** same locality as holotype, 28 Oct. 1988 (fl), *Madsen 75523* (AAU), 3 Feb. 1989 (fl), *Madsen 85771* (AAU), 20 July 1989 (fl, fr), *Madsen 86076* (AAU, QCA), 14 Oct. 1989 (fl, fr), *Madsen 86226* (AAU); above Nudo de Cajanuma, trail to Mirador, scrub and ridge-top vegetation above tree limit 3,000–3,150 m, 23 Feb. 1989 (fl), *Madsen 85826* (AAU).

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Literature Cited

Lundell, C. L. 1938. Studies in the American Celastraceae I. New species of *Microtropis*, *Wimmeria* and *Zinowiewia*. Bull. Torrey Bot. Club 65: 463–476.

———. 1939a. Revision of the American Celastraceae I. *Wimmeria*, *Microtropis*, and *Zinowiewia*. Contr. Univ. Michigan Herb. 3: 5–46, plates I–X.

———. 1939b. Studies of Mexican and Central American plants—VII. Lloydia 2: 73–108.

———. 1940. Studies in the American Celastraceae—III. Notes on Mexican and Central American species. Bull. Torrey Bot. Club 67: 616–620.

———. 1970. Studies of American Plants—II. Wrightia 4: 129–152.

———. 1981. Studies of American Plants—XX. Phytologia 48: 131–136.

———. 1985. Mesoamerican Celastraceae—III. Phytologia 57: 453–454.

———. 1987. Studies of American Plants—XXII. Phytologia 63: 73–78.

Madsen, J. E. 1991. Floristic composition, structure, and dynamics of an Upper Montane Rain forest in southern Ecuador, Part I. Pp. 11–53. Doctoral dissertation, University of Aarhus, Denmark.

Steyermark, J. A. 1988. Flora of the Venezuelan Guayana—V. Ann. Missouri Bot. Gard. 75: 1058–1086.

Turczaninow, N. 1858. Animadversiones in secundam partem herbarii Turczaninowiani, nunc Universitatis Caesareae Charkowiensis. Bull. Soc. Imp. Naturalistes Moscou 31: 379–476.

———. 1859. Animadversiones ad secundam partem catalogi plantarum herbarii Universitatis Charkowiensis. Bull. Soc. Imp. Naturalistes Moscou 32: 258–277.

Ulloa Ulloa, C. & P. M. Jørgensen. 1993. Arboles y Arbustos de los Andes del Ecuador. AAU Reports 30: 1–263.

Williams, L. O. 1964. Tropical American plants, VI. Fieldiana, Bot. 31(2): 17–48.

Description of a Rare New Cliff-dwelling Species from Kaua'i, *Schiedea attenuata* (Caryophyllaceae)

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ABSTRACT. A new species of *Schiedea* is described and illustrated. It is restricted to the sheer Kalalau cliffs on the island of Kaua'i, the oldest main island of the Hawaiian Islands. It is most closely related to the sea-cliff species *S. globosa* H. Mann from O'ahu, Moloka'i, and Maui.

Recent collecting activities in the Hawaiian Islands by Kenneth R. Wood for his own investigations of Kaua'i and for the Hawaii Plant Conservation Center of the National Tropical Botanical Garden, especially rappelling the vast cliffs of Kalalau Valley, Kaua'i, have yielded more than a dozen new species since the publication of the *Manual of the Flowering Plants of Hawai'i* (Wagner et al., 1990). Wood collected a highly distinctive new species of *Schiedea* Chamisso & Schlechtendal on one of these rappels. This species, described herein as *Schiedea attenuata* W. L. Wagner et al., is characterized by glossy, succulent, long-attenuate leaves, a short, relatively open inflorescence, perfect flowers with recurved nectary shafts, and 5–6(7) carpels. It has been collected twice on rappels into Kalalau Valley on the Kalahu side below and west of the first lookout (southwesternmost) at 700–800 m. Although the diverse mesic cliff plant communities on the upper Kalalau Valley north-facing cliffs are outstanding assemblages of rare species, fewer than 20 individuals of this new species were noted by Wood during his extensive investigations. The southwestern corner of the upper Kalalau Valley has habitats that may harbor additional populations of this rare species.

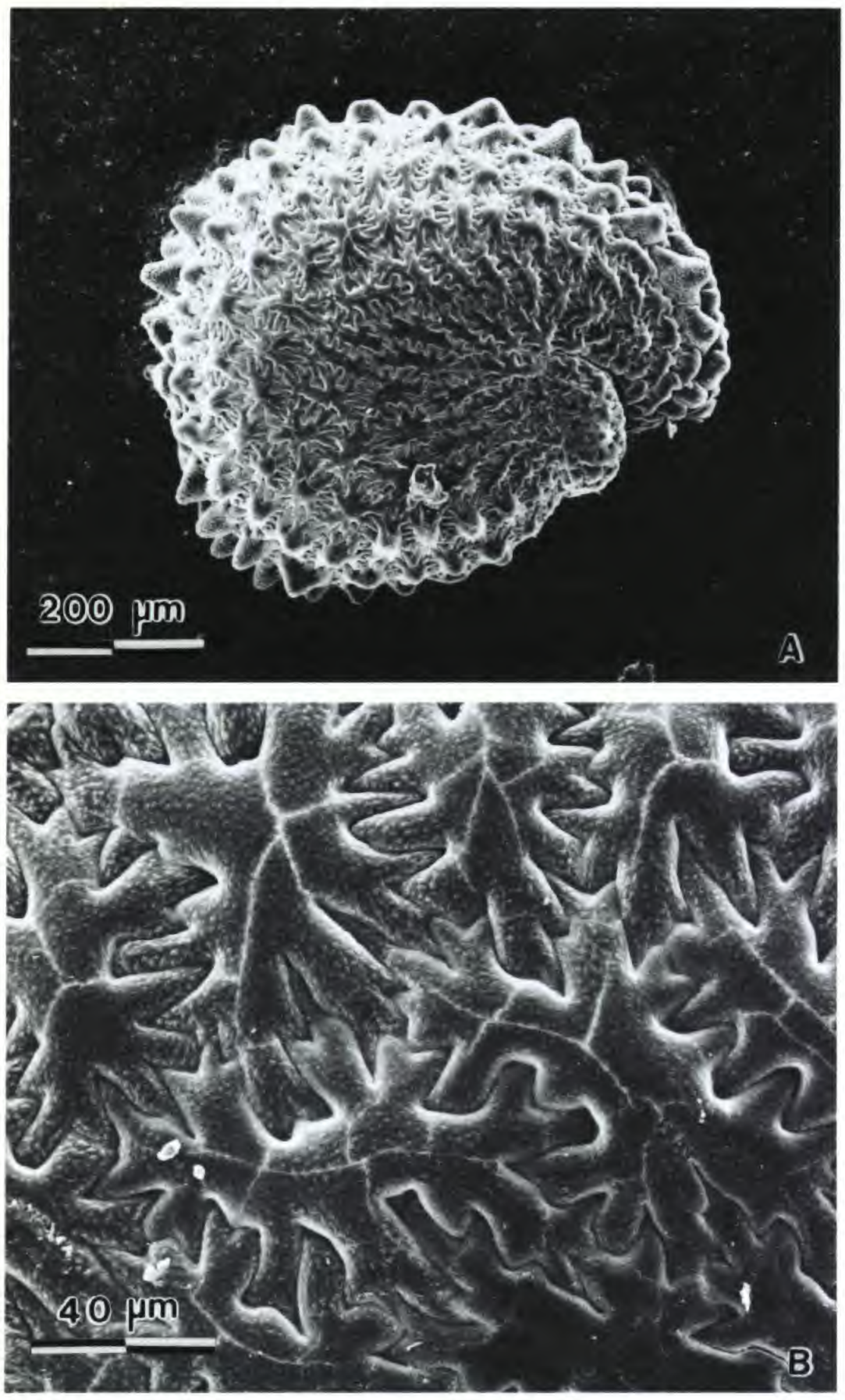
Plants grown from seed are currently under cultivation in the University of California at Irvine greenhouse as part of a collaborative study on the phylogeny and evolution of dioecy in this endemic Hawaiian genus. The extensive Kalalau Valley harbors about 20% of the species of the lineage to which *Schiedea* belongs, including, in addition to *S. attenuata*, *Alsinidendron lychnoides* (Hillebrand) Sherff, *Schiedea apokremnos* H. St. John, *S. membranacea* H. St. John, *S. nuttallii* W. J. Hooker, and *S. spergulina* A. Gray var. *spergulina*.

Schiedea and *Alsinidendron* constitute a monophyletic radiation in the Hawaiian Archipelago, based on the presence of highly specialized floral nectaries and the absence of petals in all species. Nectar is collected and presented through a hypodermic-like shaft in *Schiedea* and at the base of a flap- or cup-like structure in *Alsinidendron*. In a majority of the members of the subfamily Alsinoideae, to which the endemic Hawaiian genera belong (Pax & Hoffmann, 1934; Weller et al., 1990), the nectary is represented by a mound of nectariferous tissue bisected by a lateral furrow located on the abaxial side of each antesepalous stamen (Thomson, 1942). Ontogenetic studies indicate that the nectary differences between *Schiedea* and *Alsinidendron* represent changes in homologous structures (E. Harris and Wagner, unpublished obs.).

A preliminary phylogenetic analysis by us suggests that *Schiedea attenuata* is the sister species of the most widespread species, *S. globosa* H. Mann, a sea-cliff species found on O'ahu, Moloka'i, and Maui. Both of these species share the derived characters of succulent leaves, recurved nectary shafts, and more styles than the typical three found in most *Schiedea* species. *Schiedea globosa* differs in possessing a specialized dense globose inflorescence, a subdioecious breeding system, and a more sprawling habit. The phylogenetic analysis suggests that the hermaphroditic condition of *S. attenuata* may be secondarily derived.

Schiedea attenuata W. L. Wagner, Weller & Sakai, sp. nov. TYPE: Hawaiian Islands. Kaua'i: Hanalei District, Kalalau rim, Kalahu side below and W of first Kalalau lookout, 300 m E of plane crash [site], [22°8′N, 159°39′W, NW

Figure 1. *Schiedea attenuata* W. L. Wagner et al. —A. Habit, showing upright woody habit, slightly falcate leaves, and inflorescence. —B. Leaf, showing venation, drawn from leaf with epidermis peeled away. —C. Telescoped view showing minute hairs on leaf abaxial surface near the base. —D. Flower at early anthesis, just prior to anther



Schiedea attenuata

Figure 2. Scanning electron (SEM) photomicrographs of *Schiedea attenuata* seed from holotype. —A. Lateral view at ×100. —B. Epidermal cells of testa on face at ×500.

aspect], 790 m, 20 Nov. 1991, *K. R. Wood 1394* (holotype, US-3238878; isotype, PTBG). Figures 1, 2.

Haec species *Schiedea globosa* H. Mann habitu erectiore, inflorescentiis cymosis laxioribus 4–9 cm longis, floribus hermaphroditis inter se 2.5–13 cm distantibus et stylis 5(–6) differt.

Erect, sparingly branched shrub to 75 cm tall; internodes usually 2–9 mm long, sparsely puberulent with minute ± purplish weakly hooked or curved hairs. Leaves opposite, thick, firm and somewhat succulent, glossy, 5.3–7 cm long (to 12 cm in cultivation), 5–7 mm wide (to 11 mm in cultivation), linear-lanceolate or linear-elliptic, slightly falcate in upper half, 1- or 3-nerved; only the midrib prominent, strongly raised on abaxial surface and impressed on adaxial surface; margin slightly revolute; margin and abaxial surface sparsely puberulent near base; apex long-attenuate; base narrowly acute, gradually tapering and weakly connate. Inflorescences terminal open cymes 4–9 cm long with 14–55 flowers; lowest bracts 11 mm long, 7–8 mm wide; internodes 3–28 mm long; pedicels 8–15(–19) mm long. Flowers perfect; sepals 4–5 mm long, lanceolate, green with conspicuous scarious margins, strongly concave in upper half, reminiscent of a canoe prow, apex weakly acuminate; petals absent; nectary shafts ca. 3 mm long, recurved and appressed to the opposed sepal, the apex with an abaxial slit ca. 0.06–0.08 mm long, apparently directly releasing nectary onto the sepal; stamens 10; filaments 4.5–5.5 mm long; styles 5–6(7). Capsules ca. 4.5 mm long, dehiscent by 5–6(7) valves; seeds ca. 0.6 mm long, dark reddish brown, orbicular-reniform, compressed, the faces transversely rugose, the margins papillose; margins of testa cells obtuse to rounded.

Distribution. Known only from the cliffs of Kalalau Valley at 700–800 m, Kaua'i, Hawaiian Islands. The habitat of this site was characterized by the collector as "diverse mesic forest pockets and vertical cliffs [open canopy]; weathered basalt with occasional pockets of brown soil, growing with *Gouania* [*meyenii*], *Peucedanum* [*sandwicense*], *Poa mannii*, *Hedyotis* sp., *Lysimachia glutinosa*, *Melicope pallida*, *Nototrichium* sp. nov., *Dubautia* sp., *Dryopteris unidentata*, *Metrosideros* [*polymorpha*], *Coprosma* sp., *Vaccinium* sp., *Lipochaeta* sp., *Wilkesia* sp., *Lobelia niihauensis*, *Lepidium* [*serra*], *Nestegis* [*sandwicensis*], *Hibiscus kokio*, *Eragrostis* sp.; major threats—goats, *Erigeron* [*karvinskianus*], *Rubus* [*argutus*], *Verbena* [*littoralis*], *Lantana* [*camara*], *Setaria* sp., *Kalanchoë pinnata*, *Lythrum* [*maritimum*], and land slides."

Paratypes. HAWAIIAN ISLANDS. **Kaua'i:** Hanalei District, Kalalau rim, Kalahu side below and W of first Kalalau lookout, 300 m E of plane crash [site], [22°8′N, 159°39′W], 700–800 m, diverse mesic forest pocket and vertical cliffs, 22 Nov. 1991, *K. R. Wood 1423* (PTBG).

Acknowledgments. We thank Ken Wood for calling our attention to this interesting new species

←

dehiscence. —E. Flower in late anthesis, showing styles at final receptive stage. —F. Telescoped view of flower showing nectary shaft; shaft raised to show apical opening. —G. Early fruiting stage. —H. Seed, showing the rugose face and papillose margin. A, C–G drawn from *Wood 1394* (live collection, no voucher) cultivated at the University of California, Irvine, and from seeds from the isotype (PTBG). B and H drawn from holotype, *Wood 1394*.

and for providing us with pressed material, seeds, and cuttings of it as well as additional information about the type locality; Alice Tangerini for her accurate and excellent composite illustration; Robynn Shannon for assistance with the manuscript; E. Harris for SEMs; and Dan Nicolson for providing the Latin diagnosis.

Literature Cited

Pax, F. & K. Hoffmann. 1934. Caryophyllaceae. Pp. 275–364 *in* A. Engler & K. Prantl (editors), Die Natürlichen Pflanzenfamilien 2nd ed., Bd. 16c. Wilhelm Engelmann, Leipzig.

Thomson, B. F. 1942. The floral morphology of the Caryophyllaceae. Amer. J. Bot. 29: 333–347.

Wagner, W. L., D. R. Herbst & S. H. Sohmer. 1990. Manual of the Flowering Plants of Hawai'i. Univ. Hawaii Press and Bishop Museum Press (Special Publ. 83), Honolulu.

Weller, S. G., A. K. Sakai, W. L. Wagner & D. R. Herbst. 1990. Evolution of dioecy in *Schiedea* (Caryophyllaceae: Alsinoideae) in the Hawaiian Islands: Biogeographical and ecological factors. Syst. Bot. 15: 266–276.

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Petroravenia (Brassicaceae), a New Genus from Argentina

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ABSTRACT. *Petroravenia eseptata* Al-Shehbaz, an Argentinean new genus and species, is described and illustrated. Its relationships to *Draba* L., the North American *Cusickiella* Rollins, and the South American *Eudema* Humboldt & Bonpland, *Onuris* Philippi, *Sarcodraba* Gilg & Muschler, and *Dactylocardamum* Al-Shehbaz are discussed.

One of the Brassicaceae collections sent to MO by Stephan G. Beck (LPB) for determination was an Argentinean plant that I put aside as a novelty in *Draba*. Although the plant has almost fully developed fruits, I did not dissect any of these to examine the seeds. A loan of undetermined mustards from Instituto de Botánica Darwinion (SI), Argentina, included another collection of the same species but with dehisced fruits and mature seeds. It was immediately evident, for reasons given below, that the species cannot be accommodated in *Draba* or in any other known genus.

KEY TO *PETRORAVENIA* AND SIMILAR GENERA

1a. Cotyledons accumbent; septum complete ..... *Draba*
1b. Cotyledons incumbent; septum absent or perforate, if complete then flowers solitary, filament bases pubescent, or seeds 1 or 2 per fruit.
  2a. Flower 1 per branch; plants with numerous, fragile, fingerlike branches; fruit indehiscent, completely hidden between densely imbricate leaves; internodes rarely to 0.2 mm long; fruiting pedicels to 0.4 mm long ..... *Dactylocardamum*
  2b. Flowers few to numerous at the branch apex; plants unbranched or with stout, non-fingerlike branches; fruit dehiscent, readily visible; internodes more than 1 mm long; fruiting pedicels more than 1 mm long.
    3a. Septum absent; sepals tomentose inside, ca. 2× as long as petals; filaments flattened at least along the basal half; petals and filaments persistent even after fruit dehiscence ..... *Petroravenia*
    3b. Septum perforate or complete; sepals glabrous inside, much shorter than petals; filaments terete; petals and filaments caducous soon after anthesis.
      4a. Flowers solitary, borne on peduncles originating from the center of rosette; nectar glands 4 separate teeth, 1 on each side of the 2 lateral stamens ..... *Eudema*
      4b. Flowers in (2–)6–25-flowered inflorescences; nectar glands in a ring.
        5a. Seeds 1(–4) per fruit; plants of western United States ..... *Cusickiella*
        5b. Seeds 8–20 per fruit; plants of Argentina and southern Chile.
          6a. Inflorescences bracteate; filaments glabrous at base; septum perforated ..... *Onuris*
          6b. Inflorescences ebracteate; filaments pubescent at base; septum complete .. *Sarcodraba*

The new genus, hereafter known as *Petroravenia*, is named in honor of Peter H. Raven, director of the Missouri Botanical Garden, in recognition of his inspiration, encouragement, and continuous support of the author's research.

Petroravenia eseptata Al-Shehbaz, gen. et sp. nov. TYPE: Argentina. Prov. Salta/Jujuy: San Antonio de los Cobres, 27 km hacia paso Huaitiquina, Abra Chorrillos, conjines de *Calamogrostis* sobre la arena, 4,560 m, 30 Dec. 1986, *S. G. Beck 14136* (holotype, MO; isotype, LPB). Figures 1, 2.

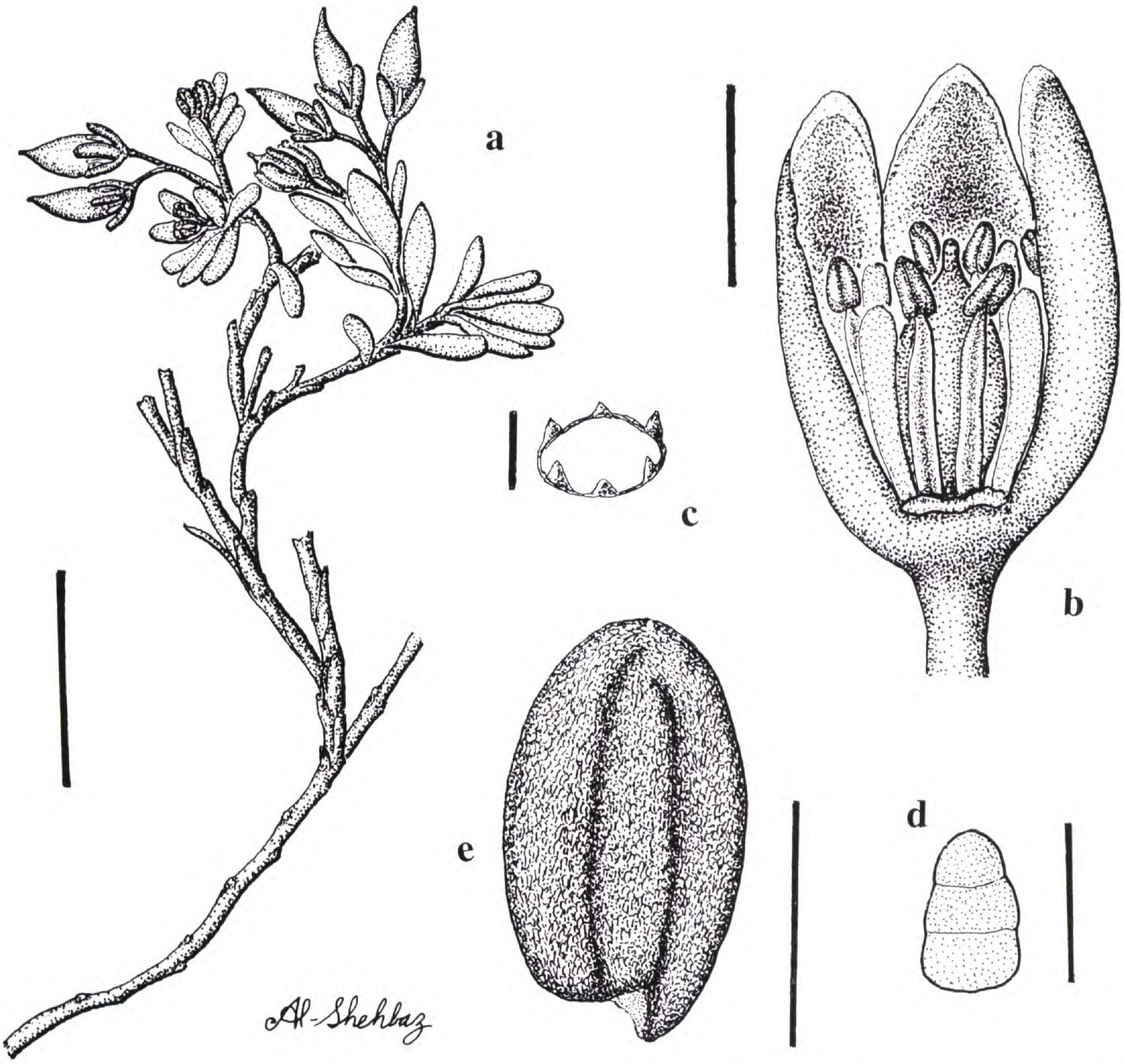
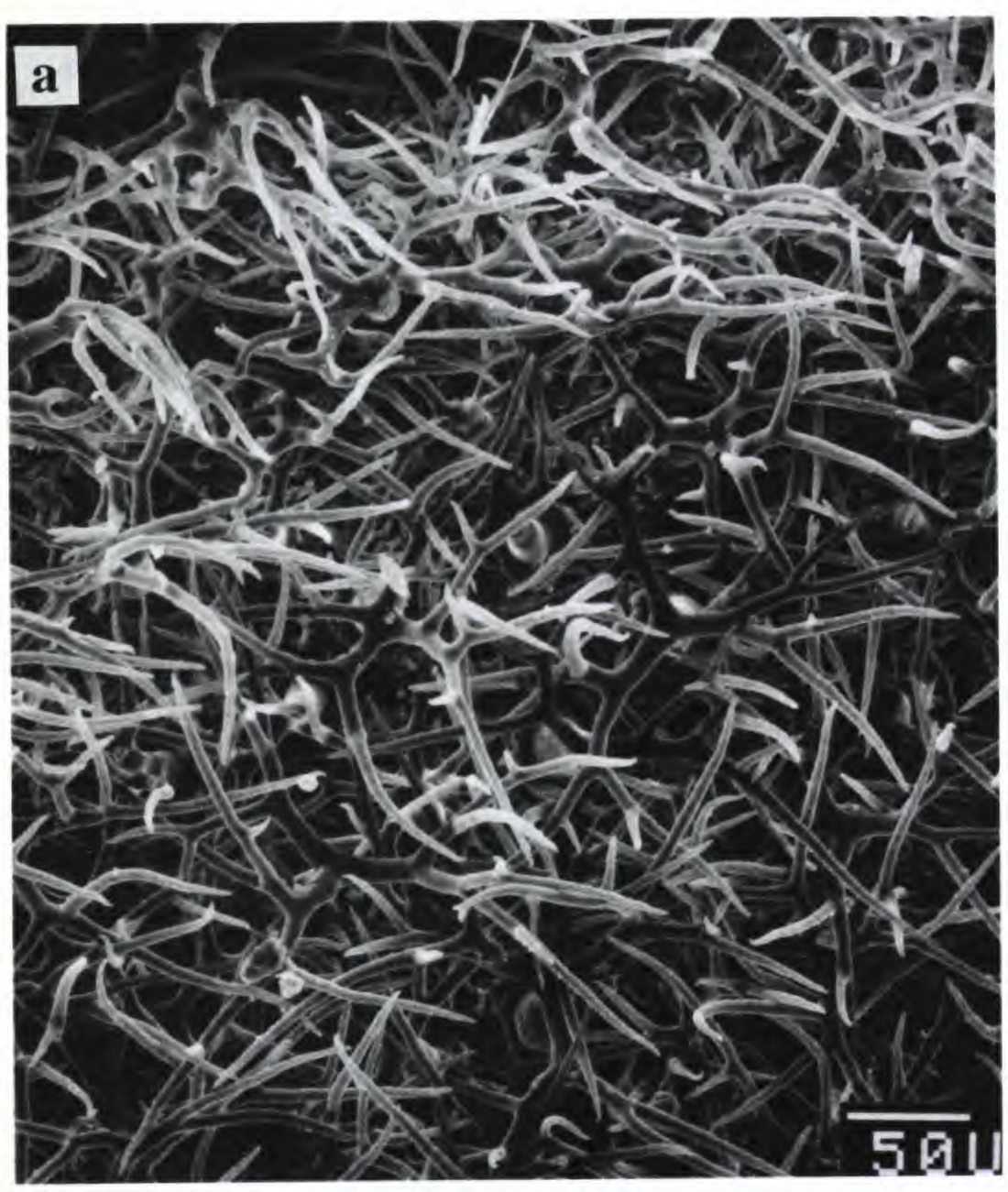
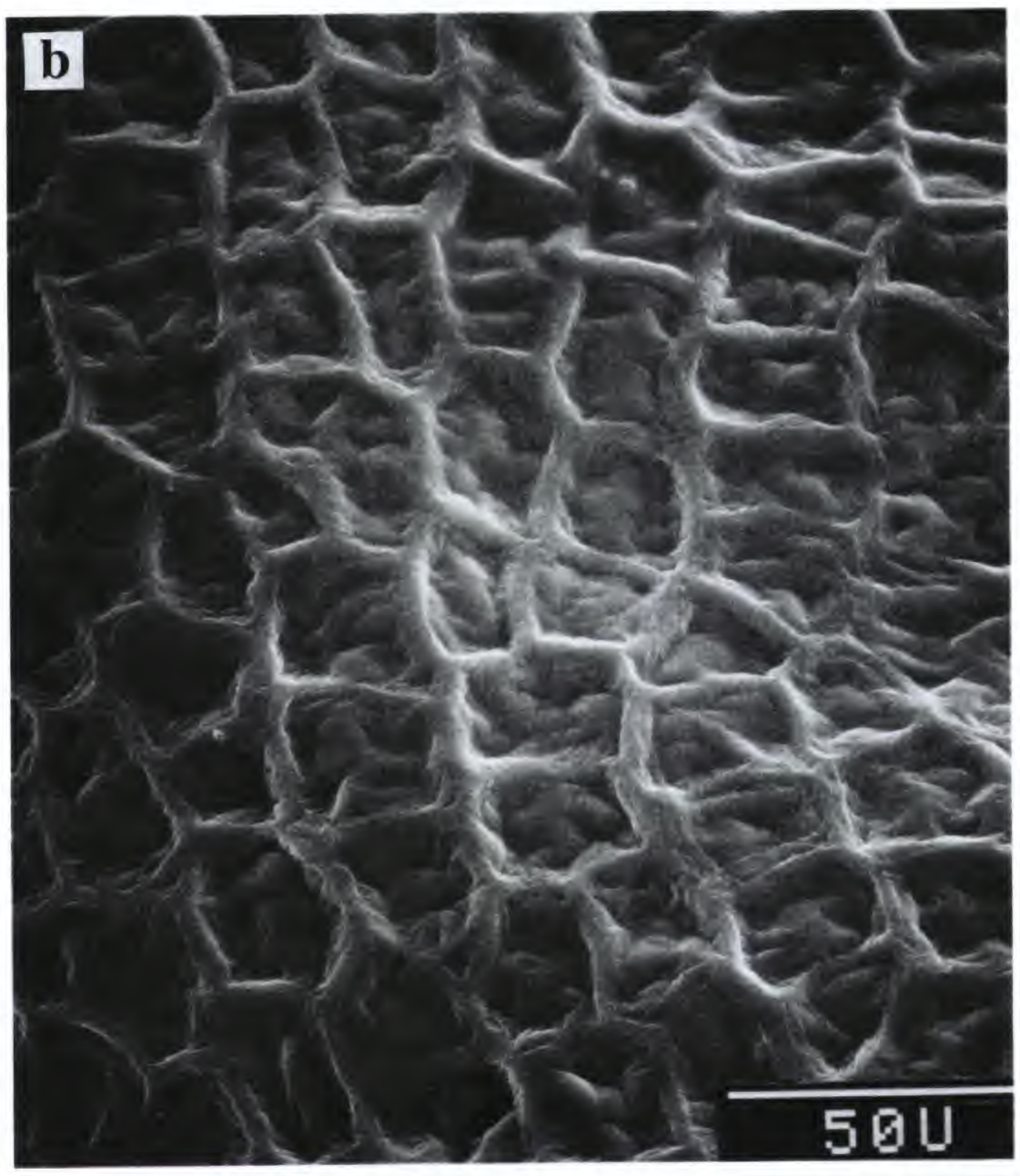


Figure 1. *Petroravenia eseptata* Al-Shehbaz. —a. Portion of plant. —b. Flower with 1 sepal removed leaving a horizontal scar. —c. Nectar glands. —d. Cross section of seed. —e. Seed. Scale: a = 1 cm, b = 1 mm, c–e = 0.5 mm. a–c drawn from holotype; d, e from paratype.

Herba rhizomatosa perennis, dense tomentosa trichomatibus brevistipitatis dendriticis tenue ramosis radiis 2–5-furcatis. Folia rosulata, sessilia, oblonga vel ovata, 2–4 mm longa, 0.6–1.7 mm lata. Inflorescentia scapo 0.7–2.0 cm longo insidens, ebracteata, 2–4-flora, subumbellata. Flos sepalis oblongis, (1.2–)1.5–2.0 mm longis, (0.5–)0.7–0.9 mm latis, persistentibus, utrinque tomentosis; petalis albis, linearibus, 0.6–1.1 mm longis, 0.2–0.3 mm latis, persistentibus; filamentis linearibus, 0.7–1.0 mm longis, 0.17–0.30 mm latis, persistentibus. Fructus pedicello (1.0–)1.3–2.6(–3.0) mm longo insidens, lanceolatus vel ovoideus, (2.0–)2.6–4.0(–5.0) mm longus, 1.3–1.8 mm latus, dense tomentosus, eseptatus; seminibus 8–18, oblongoideis, 0.8–1.0 mm longis, 0.5–0.6 mm latis, biseriatis; cotyledonibus incumbentibus.

Plants rhizomatous perennials, all aboveground parts except for petals, stamens, and seeds densely tomentose with short-stalked, finely branched dendritic trichomes with 2–5-forked rays. Rhizomes slender, to 1 mm diam., not scaly. Stems 1 to several from the rhizome, 1–2.5 cm long, often covered with persistent leaf bases of previous years, terminating in rosettes. Leaves rosulate, sessile, oblong to ovate, 2–4 mm long, 0.6–1.7 mm wide, canescent, margin entire, apex obtuse to rounded, trichomes with a bulbous base. Scapes 0.7–2 cm long, leafless; inflorescences ebracteate, 2–4-flowered, subumbellate racemes, not or hardly elongated in fruit. Sepals oblong, (1.2–)1.5–2 mm long, (0.5–)0.7–0.9 mm wide, densely tomentose outside, moderately to sparsely so inside, only narrowly membranous at and just below apex, persistent well after fruit dehiscence. Petals white, linear, 0.6–1.1 mm long, 0.2–0.3 mm wide, persistent. Filaments white,





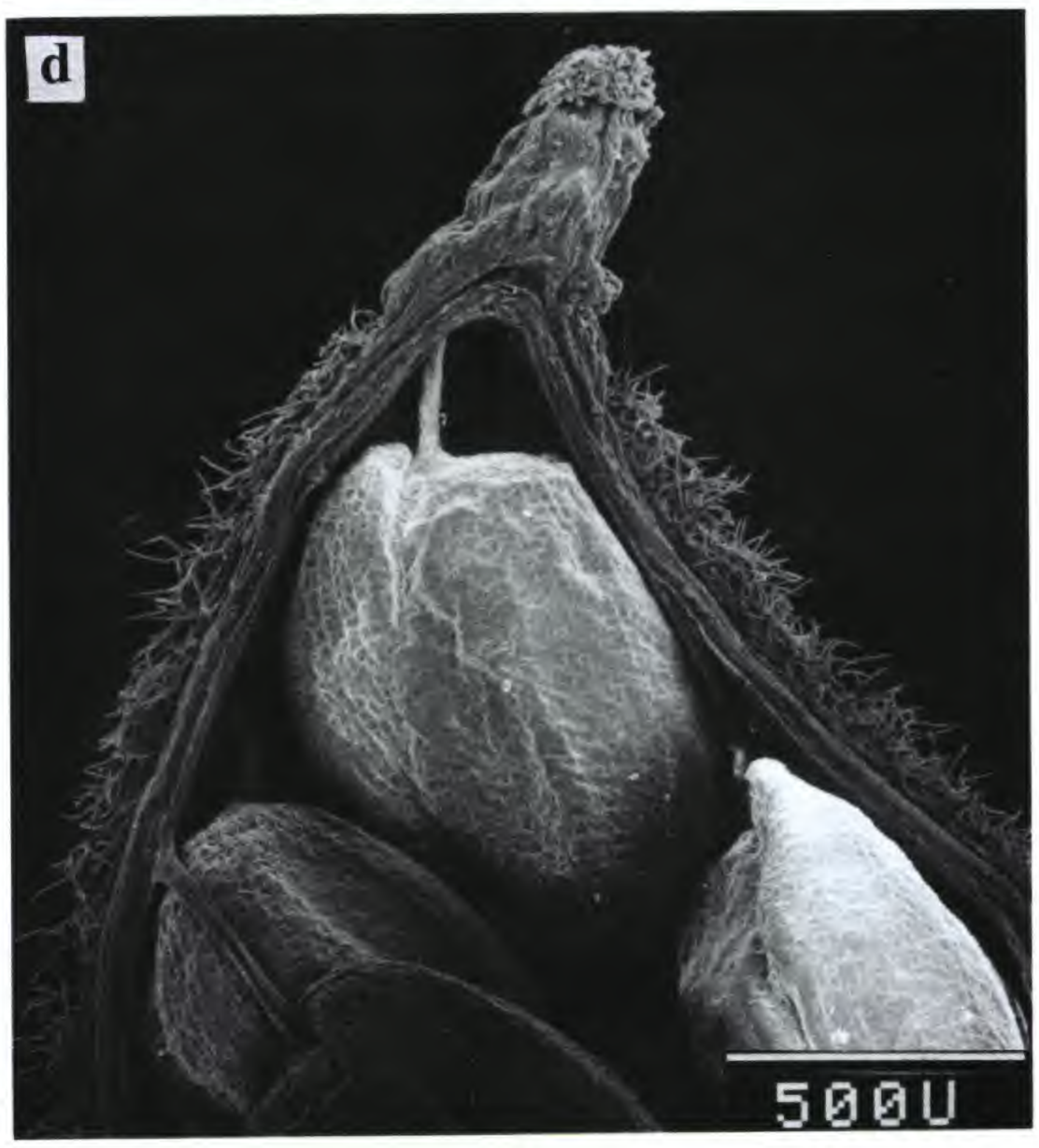


Figure 2. *Petroravenia eseptata.* —a. Trichomes of adaxial leaf surface. —b. Seed surface. —c. Fruit with 1 valve and 1 sepal removed (note pubescent inner surface of sepals and persistent petals and stamens). —d. Upper part of fruit with valve removed (note absence of septum). a drawn from holotype; b–d from paratype.

linear, 0.7–1 mm long, 0.17–0.3 mm wide, persistent, flattened; anthers oblong, 0.2–0.3 mm long. Nectar glands connate into a narrow ring subtending the bases of all filaments and extending between them into 6 triangular teeth to 0.15 mm long. Fruiting pedicels (1–)1.3–2.6(–3) mm long, straight. Fruit lanceolate to ovoid, (2–)2.6–4(–5) mm long, 1.3–1.8 mm wide, not compressed, valves rounded at base, subacute at apex, densely tomentose outside, glabrous inside; replum glabrous; septum absent; style usually subconical, 0.2–0.3 mm long; stigma entire. Seeds 8–18 per fruit, biseriate, oblong, plump, yellowish brown, 0.8–1 mm long, 0.5–0.6 mm wide, shallowly reticulate, non-mucilaginous when wet; cotyledons incumbent.

Paratype. ARGENTINA. **Prov. Jujuy:** Depto. Susques, Abra Chorrillos, *Cabrera, Bacigalupo, Botta, Deginani, Ezcurra & Zuloaga 31763* (SI; fragment, MO).

TABLE 1. Comparison of *Petroravenia* to selected genera.

	Petroravenia	*Eudema*	*Onuris*	*Sarcodraba*	*Draba*	*Dactylocardamum*	*Cusickiella*
Cotyledons	incumbent	incumbent	incumbent	incumbent	accumbent	incumbent	incumbent
Septum	absent	perforated or complete	perforated	complete	complete	absent	complete
Sepals inside	tomentose	glabrous	glabrous	glabrous	glabrous	glabrous	glabrous
Petal to sepal ratio	½–¾ as long	much longer	much longer	much longer	much longer, rarely shorter	much longer	much longer
Seeds per fruit	8–18	1–60	8–16	10–20	(1–)2–60	1	1(–4)
Flowers per inflorescence	2–4	1	(6–)10–25	20–25	2–100	1	(2–)5–20
Nectar glands	ring with 6 teeth	4 separate teeth	toothless ring	toothless ring	toothless ring or 2 or 4 teeth	4 separate teeth	toothless ring
Trichomes	dendritic	simple, branched, or absent	papillate or absent	simple or forked	simple, forked, stellate, or dendritic	simple	simple and forked
Filaments	flattened, glabrous	terete, glabrous	terete, glabrous	terete, pubescent	terete, glabrous	terete, glabrous	terete, glabrous
Number of species	1	6	5	3	±350	1	2
Distribution	Argentina	Ecuador, Peru, Bolivia, Argentina	Argentina, S. Chile	Argentina	all continents except Australia & Antarctica	Peru	western U.S.A.

A superficial examination of *Petroravenia eseptata* suggests some resemblance to *Draba*, especially in the shape of the fruit. However, this is where the important similarities end, and even in fruit shape *Draba* shows a very wide range of variation. This feature alone can hardly justify the placement of a given species in that genus.

As shown in Table 1, *Petroravenia* differs from *Draba* in the cotyledonary position, septum, sepals, petals, and stamens. First, and perhaps most important, is the cotyledonary position. *Petroravenia* has incumbent cotyledons, whereas all of the approximately 350 species of *Draba* have accumbent cotyledons. Although the cotyledonary position sometimes varies from accumbent to incumbent in a few genera, as in *Erysimum* L. (Al-Shehbaz, 1988a; Price, 1987) or, in one case (*Lepidium virginicum* L.) even in the same species (Al-Shehbaz, 1986), it is a remarkably stable character in all species of *Draba* (Al-Shehbaz, 1987; Hedge, pers. comm.; Rollins, 1988; Schulz, 1927, 1936). Two North American species previously placed in *Draba* have been segregated to *Cusickiella* (Rollins, 1988) primarily because they have incumbent instead of accumbent cotyledons and often 1-seeded fruits. In almost all *Draba* many-seeded fruits are produced, but in the South American *D. pseudocheiranthoides* Al-Shehbaz the fruits are 1- or 2-seeded (Al-Shehbaz, 1989a).

The second important difference between *Petroravenia* and *Draba* is the total lack of the fruit septum in the former and its presence as a complete partition in all species of the latter. Among the genera of Brassicaceae with dehiscent fruits, the total lack of the septum is very rare indeed and has been reported in the Peruvian *Dactylocardamum* (Al-Shehbaz, 1989b), the North American *Aphragmus eschscholtzianus* Andrzejowski ex DC. (Rollins, 1993), the Afghanistanian *Arabidopsis eseptata* Hedge (Hedge, 1968), and the Australian *Menkea* Lehmann (Shaw, 1970). Evidently, eseptate fruits have evolved independently in the family. The occurrence in the Brassicaceae of fruits without septa is far less uncommon than that of fruits with perforated septa.

The flowers of *Petroravenia* and *Draba* are also different. In the former the sepals are tomentose inside, the petals are about half as long as the sepals, and the filaments are strongly flattened and petaloid at least along the basal half. In the latter the sepals are glabrous inside, the petals (when present) are much longer than or rarely shorter than the sepals, and the filaments are usually terete throughout. In conclusion, *Petroravenia* is not closely related to *Draba* or *Cusickiella*.

Perhaps the closest relatives of *Petroravenia* are the South American *Eudema* (Ecuador, Peru, Bolivia, Argentina), *Sarcodraba* (Argentina), and *Onuris* (Patagonia). All four have incumbent cotyledons, several- to many-seeded fruits, and fruits to 3× as long as broad. *Petroravenia* differs from these genera by the same flower features that distinguish it from *Draba* (see above). The septum is lacking in *Petroravenia*, either perforated or complete in *Eudema*, perforated in *Onuris*, and complete in *Sarcodraba* (Al-Shehbaz, 1990; Boelcke & Romanczuk, 1984). Furthermore, *Petroravenia* differs from these three genera in having 2–4-flowered inflorescences and dendritic trichomes. *Eudema* species have solitary flowers borne on peduncles originating from the center of a rosette and are either glabrous or simple hairy. Two of the six *Eudema* species have branched trichomes and latiseptate fruits, but their placement in the genus has recently been questioned by Al-Shehbaz (1990), who suggested that they ought to be placed in an independent genus. Both *Onuris* and *Sarcodraba* have well-developed, (6–)10–25-flowered inflorescences and glabrous or papillate (rarely minutely forked-pubescent) leaves.

The nectar glands in *Petroravenia*, *Onuris*, and *Sarcodraba* form a ring that subtends the bases of all filaments, but in *Petroravenia* it further develops into six teeth between the filaments. In *Eudema* the median nectar glands are absent, and the lateral four are distinct teeth, one on each side of the two lateral stamens. Further differences include the presence of bracts in the inflorescences of *Onuris*, the presence of hairs on the filament bases in *Sarcodraba*, and the lack of both bracts or filament hairs in *Petroravenia*. Because of the significant differences in the inflorescences and nectar glands, it appears that *Petroravenia* is more closely related to *Onuris* and *Sarcodraba* than it is to *Eudema*.

In his account of the tribe Sisymbrieae, Schulz (1924) placed *Onuris* and *Sarcodraba* in subtribe Pachycladinae O. E. Schulz and *Eudema* in subtribe Brayinae Hayek. He separated the two subtribes primarily on the basis of the former's having a confluent nectar gland and the latter's lacking median nectar glands. As argued by Al-Shehbaz (1988b), however, Schulz's (1924, 1936) subtribal account of the Sisymbrieae needs a major revision.

Although both have incumbent cotyledons and lack the septum, *Petroravenia* apparently is not closely related to *Dactylocardamum*. The latter is unique in the entire Brassicaceae in having few individual fruits that are completely concealed between the densely imbricated leaves. It is also quite different in producing one flower per branch, in

forming dense cushions, and in having fingerlike fragile branches (Al-Shehbaz, 1989b). *Petroravenia* has few-flowered inflorescences, forms no cushions, and has leafy nonfragile branches.

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Literature Cited

Al-Shehbaz, I. A. 1986. The genera of Lepidieae (Cruciferae; Brassicaceae) in the southeastern United States. J. Arnold Arbor. 67: 265–311.

———. 1987. The genera of Alysseae (Cruciferae; Brassicaceae) in the southeastern United States. J. Arnold Arbor. 68: 185–240.

———. 1988a. The genera of Anchonieae (Hesperideae) (Cruciferae; Brassicaceae) in the southeastern United States. J. Arnold Arbor. 69: 193–212.

———. 1988b. The genera of Sisymbrieae (Cruciferae; Brassicaceae) in the southeastern United States. J. Arnold Arbor. 69: 213–237.

———. 1989a. New or noteworthy *Draba* (Brassicaceae) from South America. J. Arnold Arbor. 70: 427–437.

———. 1989b. *Dactylocardamum* (Brassicaceae), a remarkable new genus from Peru. J. Arnold Arbor. 70: 515–521.

———. 1990. Generic limits and taxonomy of *Brayopsis* and *Eudema* (Brassicaceae). J. Arnold Arbor. 71: 93–109.

Boelcke, O. & M. C. Romanczuk. 1984. Cruciferae. Fl. Patagonica 4A: 373–544.

Hedge, I. C. 1968. Sisymbrieae. *In:* K. H. Rechinger (editor), Fl. Iranica 5: 309–342. Akademische Druck- u. Verlagsanstalt, Graz, Austria.

Price, R. A. 1987. Systematics of the *Erysimum capitatum* alliance (Brassicaceae) in North America. Unpublished Ph.D. Dissertation, University of California, Berkeley.

Rollins, R. C. 1988. *Cusickiella*, a new genus of the Cruciferae. J. Jap. Bot. 63: 65–69.

———. 1993. The Cruciferae of Continental North America. Stanford University Press.

Schulz, O. E. 1924. Cruciferae—Sisymbrieae. *In:* A. Engler (editor), Das Pflanzenreich IV 105(Heft 86): 1–388. Wilhelm Engelmann, Leipzig, Germany.

———. 1927. Cruciferae—*Draba* et *Erophila*. *In:* A. Engler (editor), Das Pflanzenreich IV 105(Heft 89): 1–396. Wilhelm Engelmann, Leipzig, Germany.

———. 1936. Cruciferae. *In:* H. Harms (editor), Nat. Pflanzenfam. ed. 2, 17B: 227–658. Wilhelm Engelmann, Leipzig, Germany.

Shaw, E. A. 1970. A revision of the genus *Menkea*. Contr. Gray Herb. 200: 175–189.

Three New South American Species of *Draba* (Brassicaceae)

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ABSTRACT. *Draba lapaziana*, *D. inquisiviana*, and *D. loayzana* are described and illustrated. All three grow in Bolivia, and the first and last also occur in Peru and Argentina, respectively. The leaf and fruit trichomes of some of these and their nearest relatives are presented.

Knowledge of the South American *Draba* is expanding considerably, and as many as 11 species have recently been added (Al-Shehbaz, 1989, 1990, 1991, 1992; Rangel & Santana, 1989). The description of three species below brings the total number of the South American *Draba* species to 70.

Draba lapaziana Al-Shehbaz, sp. nov. TYPE: Bolivia. Depto. La Paz: Prov. Murillo, pass at the head of the Valle del Zongo and lower slopes of Nevado Huayna Potosí, 4,700–4,900 m, 16°17′S, 68°07′W, loose bare soil of terminal and lateral moraines, 7 Feb. 1985, *J. C. Solomon 13219* (holotype, MO; isotypes, GH, LPB). Figures 1a, b, 2c, d.

Herba perennans pulvinata. Folia rosulata oblanceolata vel spathulata, (3–)5–8(–10) mm longa, tomentosa, pilis substellatis brevi stipitatis basi bulbosis. Scapi 5–10(–15) mm longi, apice subclavatis dense tomentosi; inflorescentiae umbellatae, 2–4-bracteatae; pedicelli fructiferi subclavati, 0.5–1.2(–2) mm longi, basi glabrescentes. Sepala oblonga, persistentia, (1.4–)1.7–2.2 mm longa; petala alba, oblanceolata vel subspathulata, 1.1–1.4 mm longa. Fructus oblongi, tomentosi, (2.1–)2.4–3(–3.3) mm longi, 1.1–1.4 mm lati. Semina ovata, 0.5–0.7(–0.8) mm longa, 4–7 in quamque loculam.

Herbs scapose, caespitose, forming cushions, 1–2 cm tall. Caudex with several to numerous fine branches each terminating in a rosette and covered with some leaf remains of previous years. Leaves rosulate, thin, oblanceolate to spatulate, (3–)5–8(–10) mm long, (0.5–)1–2(–3) mm wide, subsessile, attenuate at base, entire, subacute to obtuse at apex, densely to moderately tomentose on both surfaces with short-stalked, bulbous-based, substellate trichomes with finely branched rays. Scapes 10–70, 5–10(–15) mm long, subclavate and densely tomentose near the tip, slender and sparsely hairy at base. Inflorescences 2–4-bracteate umbels; bracts unequal, early deciduous or rarely persisting till fruit maturity. Sepals oblong, (1.4–)1.7–2.2 mm long, ca. 0.7 mm wide, narrowly scarious at margin, tomentose, persistent. Petals white, oblanceolate or subspatulate, 1.1–1.4 mm long, 0.3–0.4 mm wide, narrowed to a clawlike base. Filaments white, ca. 0.8 mm long; anthers ovate, ca. 0.2 mm long. Fruiting pedicels 0.5–1.2(–2) mm long, subclavate, tomentose, often glabrescent at base. Fruits oblong, (2.1–)2.4–3(–3.3) mm long, 1.1–1.4 mm wide, not compressed; valves obtuse at both ends, tomentellous with short-stalked furcate trichomes with few lateral branches; style 0.1–0.2 mm long. Seeds 4–7 per locule, ovate, brown, somewhat compressed, 0.5–0.7(–0.8) mm long, 0.3–0.4 mm wide.

Draba lapaziana is most closely related to *D. argentifolia* Al-Shehbaz, from which it is readily distinguished by its non-compressed fruits, bracteate umbels, subclavate peduncles and pedicels, and 4–7 seeds per locule. *Draba argentifolia* is a Peruvian endemic with compressed fruits, ebracteate racemes with very short rachises, cylindric peduncles and pedicels, and (10–)11–12(–14) seeds per locule. A comparison of the adaxial leaf surfaces of the holotypes of *D. lapaziana* and *D. argentifolia* (Fig. 2a, c) reveals that the trichomes in the former are finely branched, substellate, and bulbous based, whereas in *D. argentifolia* they are simple or furcate and not bulbous based. However, the paratypes of *D. lapaziana* have simple and furcate trichomes on the adaxial leaf surface. Although the fruit trichomes in both species are basically similar in branching, they are much smaller in *D. lapaziana* than in *D. argentifolia* (Fig. 2b, d).

Paratypes. BOLIVIA. **Depto La Paz:** Prov. Murillo, vicinity of Lago Zongo at the end of Zongo Vally, *Solomon 13156* (GH, LPB, MO); between La Paz and Cumbre, 4,300 m, 6 Mar. 1969, *Doppelbaur s.n.* (M, MO); Chacaltaya, *Buchtien 1873* (US). PERU. **Prov. Huarochiri:** Depto. Lima, Lago Aguascocha, near Mino Caprichosa, above Casapalca, 4,780 m, *Hutchinson & Tovar 4265* (F, GH, MO, NY, UC, US).

Draba loayzana Al-Shehbaz, sp. nov. TYPE: Bolivia. Depto La Paz: Prov. Loayza, Caxta 7 km hacia Quime, 4,540 m, 19 Feb. 1981, *St. G. Beck 4352* (holotype, MO; isotype, LPB). Figures 1c–e, 3a, b.

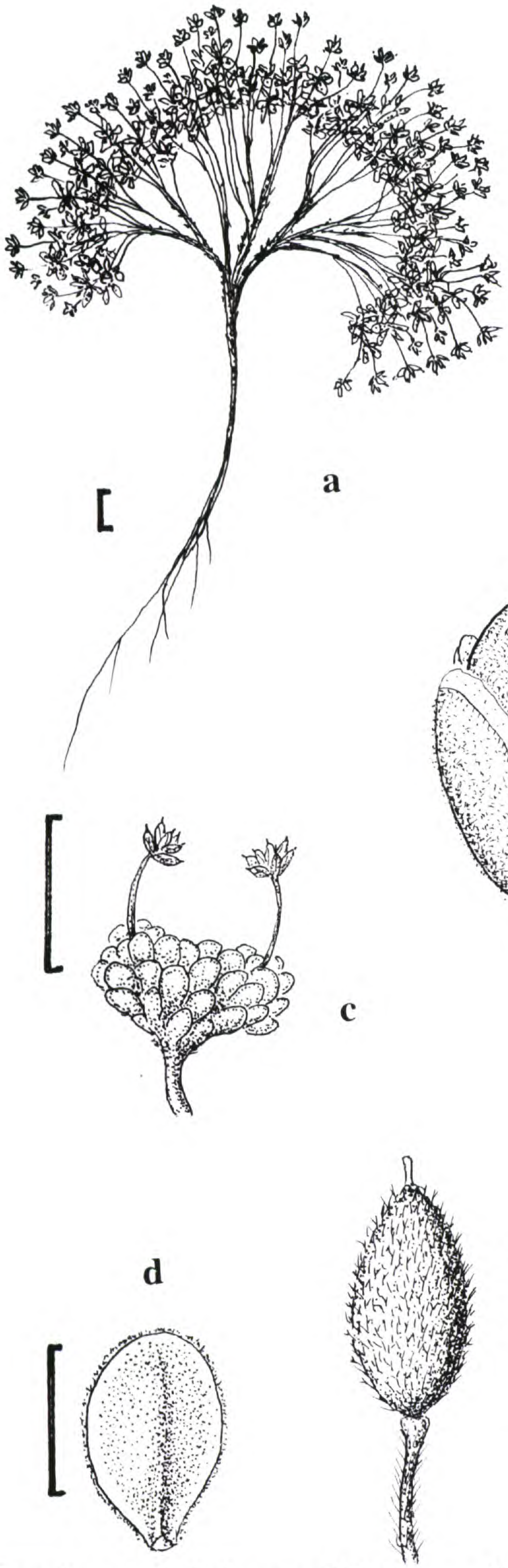

Figure 1. a, b, *Draba lapaziana* Al-Shehbaz. —a. Plant. —b. Infructescence. c–e, *D. loayzana* Al-Shehbaz. —c. Plant. —d. Leaf (abaxial surface facing). —e. Fruit. f, g, *D. inquisiviana* Al-Shehbaz. —f. Plant. —g. Fruit. Scale: a, c, f = 1 cm; b, d, e, g = 1 mm. All drawn from holotypes.

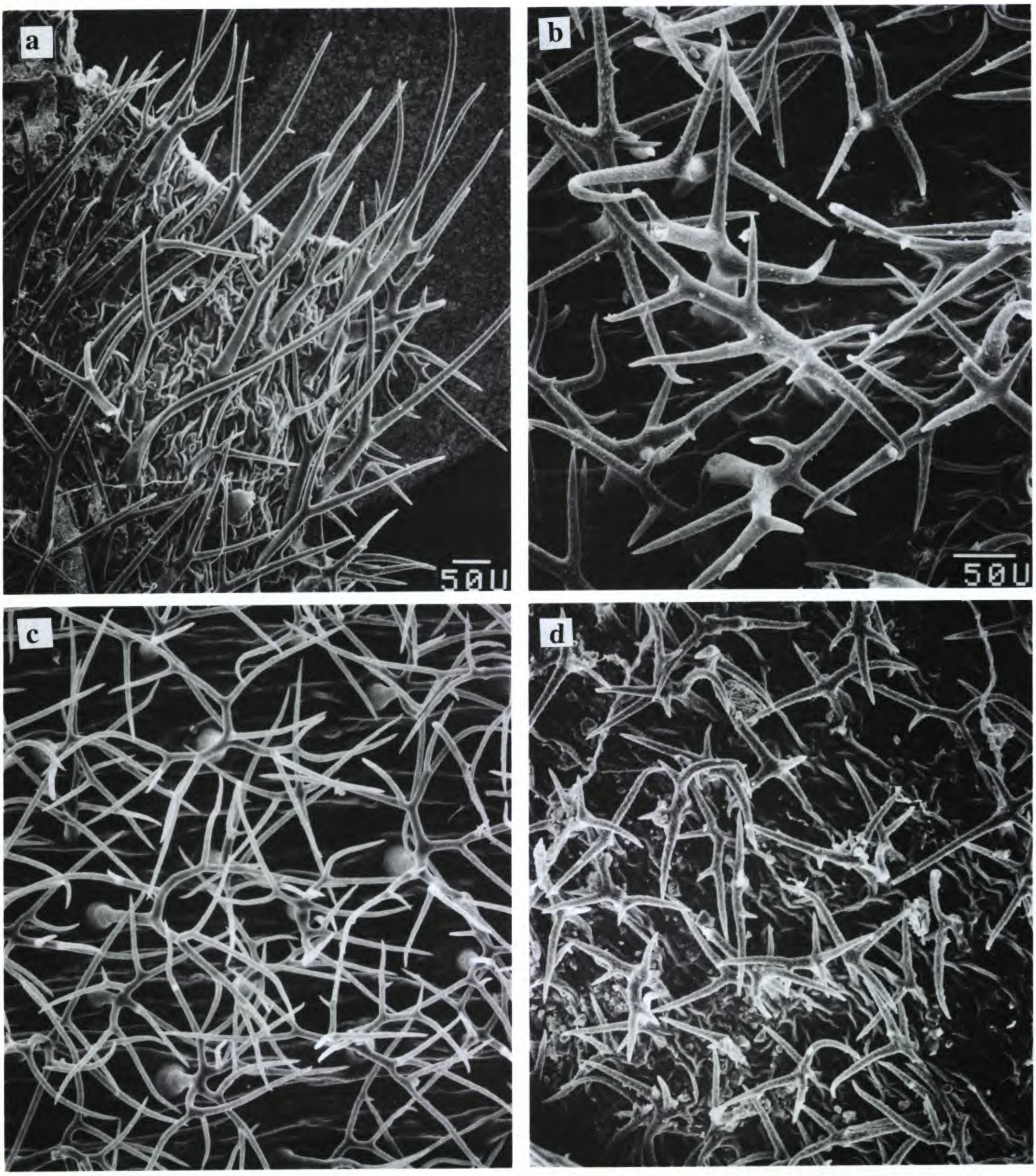

Figure 2. Leaf and fruit trichomes of *Draba argentifolia* Al-Shehbaz and *D. lapaziana* Al-Shehbaz. a, b, *D. argentifolia*. —a. Adaxial leaf surface. —b. Fruit surface. c, d, *D. lapaziana*. —c. Adaxial leaf surface. —d. Fruit surface. Scales in c, d as in b. All from holotypes.

Herba perennans nana scaposa. Folia basalia rosulata, dense imbricata, suborbiculata vel late ovata vel oblonga, crassi coriacea, (1–)2–3.5(–5) mm longa, 1–1.5(–2) mm lata, inferne glabra, superne dense tomentella, pilis longe stipitatis stellatis. Scapi 2–10 mm longi; inflorescentiae ebracteatae, subumbellatae; pedicelli fructiferi 0.7–1.3 mm longi. Sepala oblonga, persistentia, 1.5–1.7 mm longa, tomentella, marginibus membranacea; petala alba, spathulata, 1–1.3 mm longa. Fructus oblongi, compressi, 1.8–2.5 mm longi, 1.2–1.3 mm lati. Semina compressa, 0.6–0.7 mm longa, 4–7 in quamque loculam.

Herbs scapose, caespitose, tiny perennials with slender long taproots. Caudex with several short branches each densely covered with leaf remains of previous years and terminated in a rosette. Basal leaves rosulate, densely imbricate, suborbicular to broadly ovate or oblong, (1–)2–3.5(–5) mm long, 1–1.5(–2) mm wide, subsessile or with a broad petiolelike base to 1.5 mm long, fleshy and appearing thick leathery upon drying, glabrous abaxially,

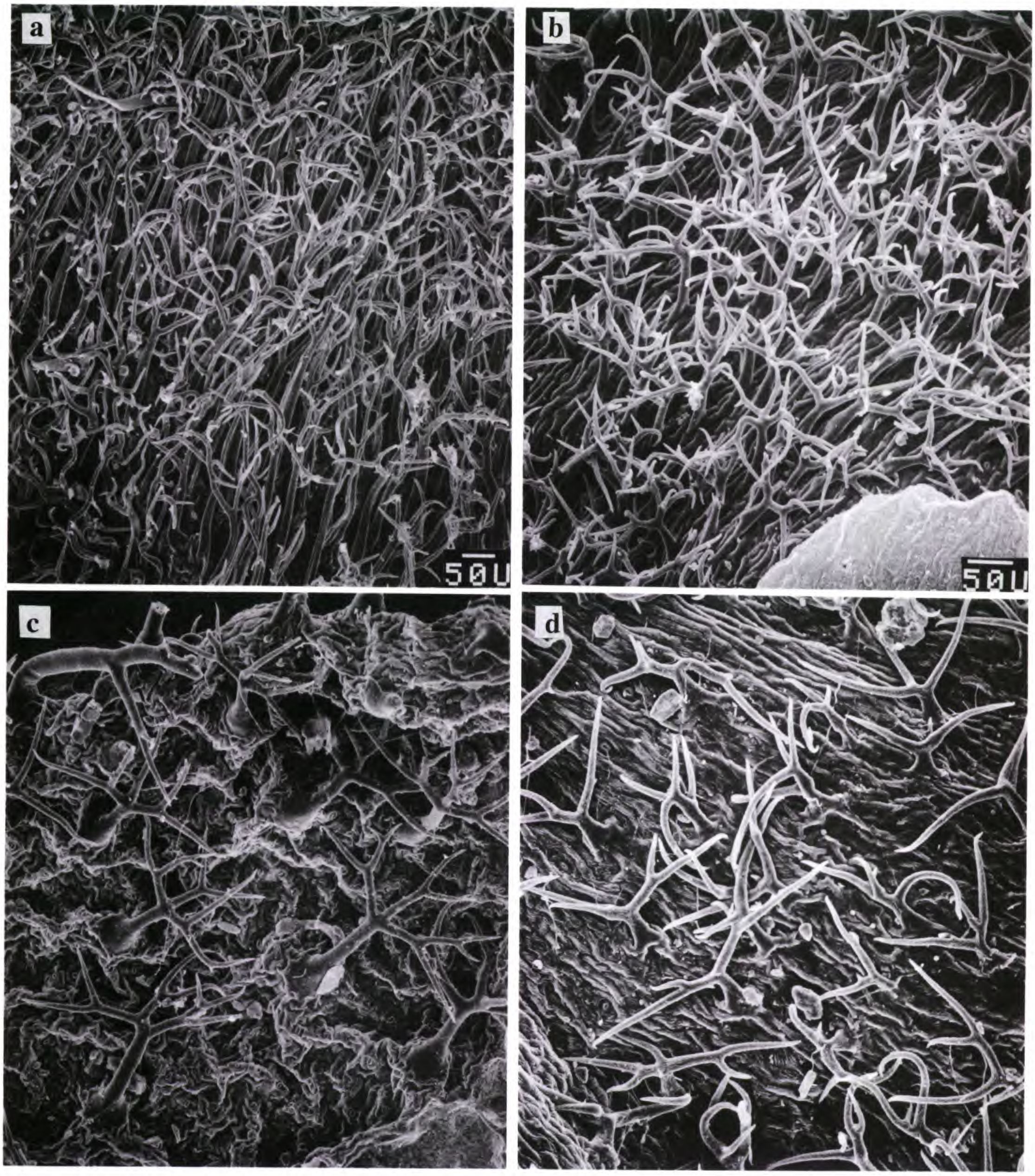

Figure 3. Leaf and fruit trichomes of *Draba loayzana* Al-Shehbaz and *D. burkartiana* O. E. Schulz. a, b, *D. loayzana*. —a. Adaxial leaf surface. —b. Fruit surface (part of persistent sepal in the lower right corner). c, d, *D. burkartiana*. —c. Adaxial leaf surface. —d. Fruit surface. Scales in c as in a, and in d as in b. All from holotypes.

densely tomentellous adaxially with long-stalked, subappressed, stellate, fine-branched trichomes often intermingled at leaf margin and apex, ciliate at least near the base, margin entire, often somewhat incurved, apex rounded to obtuse. Scapes leafless, 2–10 mm long, densely tomentellous; inflorescences (2 or)3–5(–7)-flowered, subumbellate, ebracteate racemes not elongated in fruit. Sepals oblong, 1.5–1.7 mm long, 0.6–0.8 mm wide, erect, persistent even after fruit dehiscence, densely tomentellous outside, glabrous inside, with a membranous margin 0.1–0.2 mm wide. Petals white, spatulate, 1–1.3 mm long, 0.5–0.7 mm wide, persistent, subtruncate to shallowly emarginate at apex. Filaments white, 0.7–0.8 mm long; anthers ovate, ca. 0.17 mm long. Fruiting pedicels ascending to subdivaricate, densely tomentellous, 0.7–1.3 mm long. Fruit oblong, 1.8–2.5 mm long, 1.2–1.3 mm wide, compressed, round-

ed at both ends; valves sparsely tomentellous; style 0.16–0.2 mm long. Seeds 4–7 per locule, broadly ovate, 0.6–0.7 mm long, 0.4–0.5 mm wide, subcompressed, brown.

Draba loayzana is most closely related to *D. burkartiana* O. E. Schulz, which it resembles in having persistent sepals and ebracteate inflorescences. From the latter, *D. loayzana* is easily distinguished by its fleshy leaves that are adaxially densely tomentellous and abaxially glabrous, densely tomentellous sepals, oblong compressed fruits, and nonciliate petiolar leaf bases with stalked trichomes to ca. 0.4 mm long. In contrast, *D. burkartiana* has nonfleshy leaves that are glabrescent or sparsely to densely hirsute on both surfaces, glabrous or sparsely pilose sepals, ovate plump fruits, and ciliate petiolar leaf bases with simple or long-stalked furcate trichomes to ca. 1 mm long.

The leaf trichomes in *Draba loayzana* are finely branched, very dense, long stalked, and not bulbous based, whereas those of *D. burkartiana* are coarsely branched, very sparse, and bulbous based (Fig. 3a, c). The fruit trichomes in *D. loayzana* are dense and severally branched, whereas in *D. burkartiana* they are sparse and few branched (Fig. 3b, d).

Most of the plants of *Krapovickas & Fuchs 6780* (BAA) belong to *Draba macleanii* J. D. Hooker. The smaller plant previously annotated by the author as *D.* cf. *burkartiana* belongs to *D. loayzana.*

Paratypes. ARGENTINA. **Prov. Jujuy:** Depto. Yavi, Cerro Poposayo, 4,700 m, 1 Feb. 1953, *Sleumer 3703* (BAA, MO, SI). BOLIVIA. **Depto. La Paz:** Cumbre de Yungas, ca. 22 km from La Paz, 4,600 m, 15 Feb. 1950, *Krapovickas & Fuchs 6780* (BAA; fragment, MO).

Draba inquisiviana Al-Shehbaz, sp. nov. TYPE: Bolivia. Depto. La Paz: Prov. Inquisivi, Cord. Tres Cruces, morrenas al lado del glaciar Atoroma-Tres Cruces, 4,800 m, 10 Feb. 1980, *E. Jordan 111* (holotype, MO; isotype, LPB). Figure 1f, g.

Herba perennans nana scaposa, 5–12 mm alta. Folia basalia rosulata, oblonga vel ovata, sessilia, 3–5(–7) mm longa, inferne pilis 2–4-furcatis stipitatis, superne pilis appressis simplicibus praedita. Inflorescentiae subumbellatae, 1–3-bracteatae; pedicelli fructiferi (1–)1.3–1.7 mm longi, pilis subapressis simplicibus. Sepala oblonga, caduca, 1.3–1.7 mm longa; petala alba, spathulata, 1.3–1.7 mm longa. Fructus lanceolati vel anguste ovati, (2–)2.3–2.7(–3.3) mm longi, pilis subappressis simplicibus et stipitatis furcatis. Semina ovoidea, compressa, 0.5–0.7 mm longa, 3–6 in quamque loculam.

Herbs scapose, caespitose, tiny perennials 5–12 mm high (including mature infructescences). Caudex with 2–7 minute branches each terminating in a rosette and together forming a compact group 0.5–2.5 cm diam. Basal leaves rosulate, sessile, oblong to obovate, 3–5(–7) mm long, 1–2(–3) mm wide, slightly narrowed at base, abaxial surface with stalked 3-forked or cruciform trichomes, sometimes with 2-forked ones near base, adaxial surface with simple appressed trichomes 0.3–0.5(–0.7) mm long, margin entire, ciliate with simple and 2-forked trichomes, apex obtuse to rounded. Scapes leafless, (1–)3–6 mm long, densely hirsute with spreading simple trichomes to 0.7 mm long. Inflorescences subumbellate, 1–3-bracteate; rachises 0.5–1 mm long. Sepals narrowly oblong, lavender with white margin and apex, 1.3–1.7 mm long, 0.6–0.7 mm wide, caducous, entire, obtuse at apex, pubescent with simple and furcate trichomes. Petals white, spatulate, 1.3–1.7 mm long, ca. 0.5 mm wide, tapering to a clawlike base ca. 0.5 mm long. Filaments white, 0.8–1.1 mm long; anthers broadly ovate, ca. 0.15 mm long. Fruiting pedicels (1–)1.3–1.7 mm long, densely covered at least near receptacle with antrorsely appressed simple trichomes. Fruits lanceolate to narrowly ovate, (2–)2.3–2.7(–3.3) mm long, 1.2–1.4(–1.5) mm wide; valves obtuse at base, subacute at apex, densely hirsute with antrorse subappressed 2-forked and simple trichomes to 0.3 mm long at margin; styles glabrous, ca. 0.3 mm long. Seeds 3–6 per locule, ovoid, compressed, 0.5–0.7 mm long, 0.3–0.5 mm wide.

Draba inquisiviana is closely related to *D. discoidea* Weddell, from which it is readily distinguished by its sepals 0.6–0.7 mm wide, petals 1.3–1.6 × 0.5 mm, anthers ca. 0.15 mm long, fruiting pedicels (1–)1.3–1.7 mm long, lanceolate to narrowly ovate fruits 1.2–1.4(–1.5) mm wide, fruit valves with antrorsely subappressed trichomes, and light brown seeds 0.5–0.7 × 0.3–0.5 mm. In contrast, *D. discoidea* has sepals (0.9–)1–1.4(–1.5) mm wide, petals 2–2.3(–3) × 1–1.4 mm, anthers 0.3–0.4(–0.5) mm long, fruiting pedicels (1.5–)2–5(–8) mm long, orbicular to broadly ovate fruits (1.5–)3–4(–5) mm wide, fruit valves (when pubescent) with trichomes perpendicular to the surface, and dark reddish brown seeds (0.9–)1–1.2 × 0.7–0.8 mm. Bolivian plants described by Schulz (1927) as *D. herzogii* O. E. Schulz resemble *D. inquisiviana* in plant size and leaf indumentum and appear to be small forms of *D. discoidea.*

Acknowledgments. I am most grateful to Henk van der Werff for checking the Latin descriptions and to Mike Veith (Washington University) for helping with the SEM work.

Literature Cited

Al-Shehbaz, I. A. 1989. New or noteworthy *Draba* (Brassicaceae) from South America. J. Arnold Arbor. 70: 427–437.

———. 1990. A note on the Chilean endemic *Draba thlaspiformis* (Brassicaceae). J. Arnold Arbor. 71: 385–387.

———. 1991. Novelties in *Draba* (Brassicaceae) from Venezuela, Ecuador, and Peru. Novon 1: 67–70.

———. 1992. *Draba barclayana* (Brassicaceae), a new species from Colombia. Novon 2: 4–5.

Rangel, J. O. & E. Santana. 1989. Estudios en *Draba* (Cruciferae) de Colombia. 1. Cuatro especies nuevas de la Cordillera Oriental. Revista Acad. Colomb. Ci. 17: 347–355.

Schulz, O. E. 1927. Cruciferae—*Draba* et *Erophila*. Das Pflanzenreich IV 105(Heft 89): 1–396.

A New Species of *Solanum* Section *Cyphomandropsis* (Solanaceae) from Bolivia

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ABSTRACT. A new species of *Solanum* sect. *Cyphomandropsis* (Solanaceae), *S. hibernum*, is described from the western part of Dept. Santa Cruz, Bolivia. Its strongly discolorous leaves densely covered below with white dendritic hairs distinguish it from the other species in the section.

Solanum sect. *Cyphomandropsis* Bitter includes about 10–20 species of South American shrubs. The delimitation and phylogenetic affinities of the section are problematical at present, but it is almost certainly the sister group of the segregate genus *Cyphomandra* Sendtner (Bohs, in press). Synapomorphies uniting *Cyphomandra* and *Solanum* sect. *Cyphomandropsis* include tapered anthers with small terminal pores not expanding into longitudinal slits, large chromosomes (> 4 μm long), and large amounts of nuclear DNA (Bohs, 1989; Moscone, 1992; Pringle & Murray, 1991).

I am completing a taxonomic revision of the section, with the goal of clarifying species and sectional limits, examining phylogenetic relationships, and assessing generic affinities. During the course of this work, I encountered the new species described below.

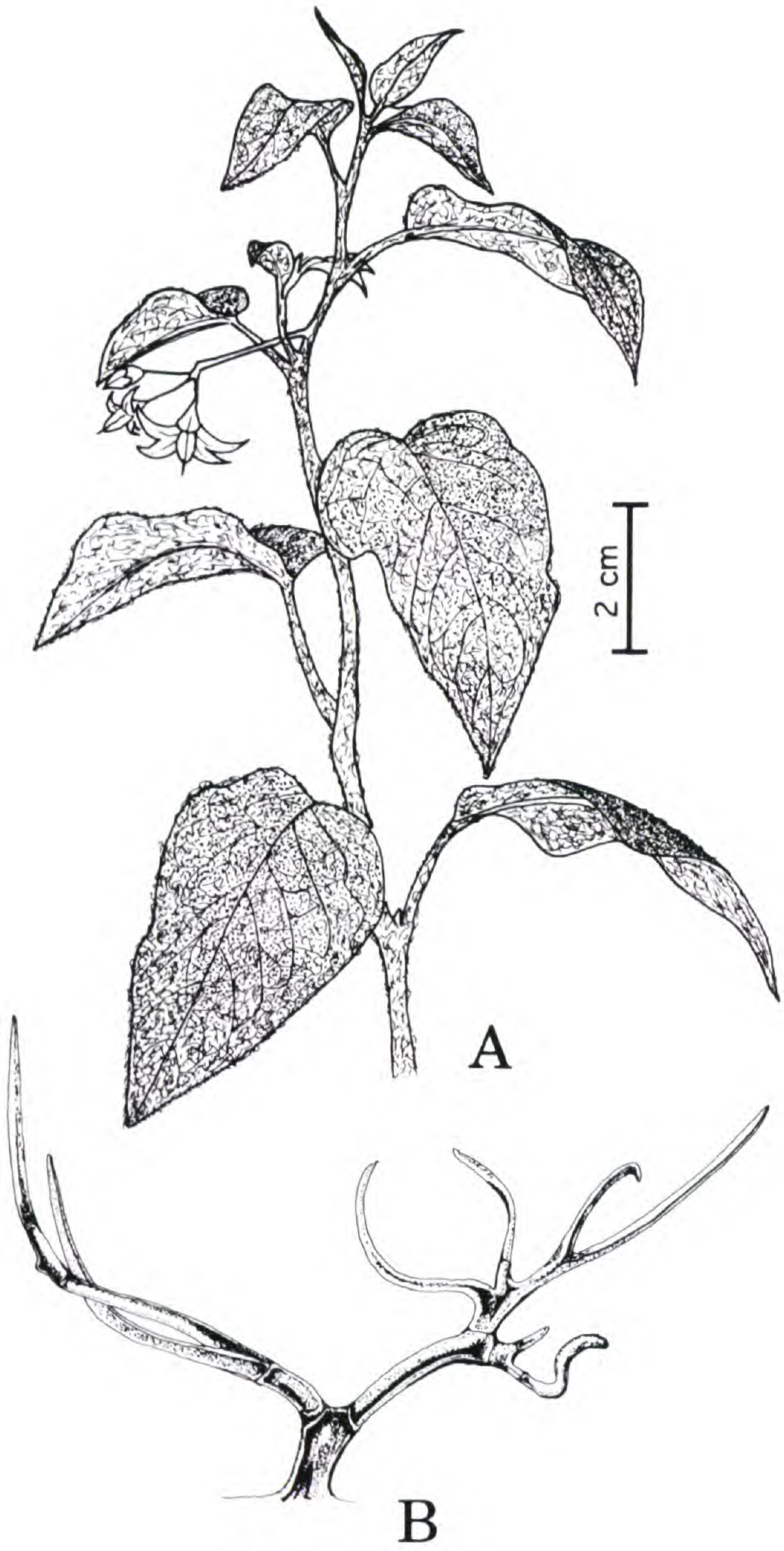
Solanum hibernum Bohs, sp. nov. TYPE: Bolivia. Dept. Santa Cruz: Prov. Florida, 3 km S of Mataral, valley of Río Ciénega, 18°8′S, 64°13′W, 1,400 m, 1 Feb. 1987 (fl, fr), *Nee & Coimbra 33970* (holotype, US #3146788; isotypes, LPB, NY, TEX). Figure 1.

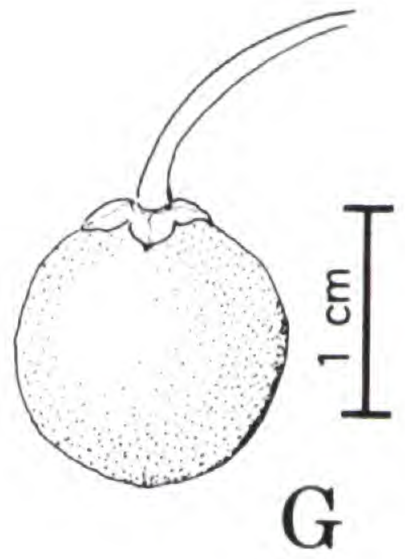
Solano luteoalbo Persoon affine, a quo differt foliis valde discoloribus infra pilis albis ramosis dense obtectus, et inflorescentiis brevibus.

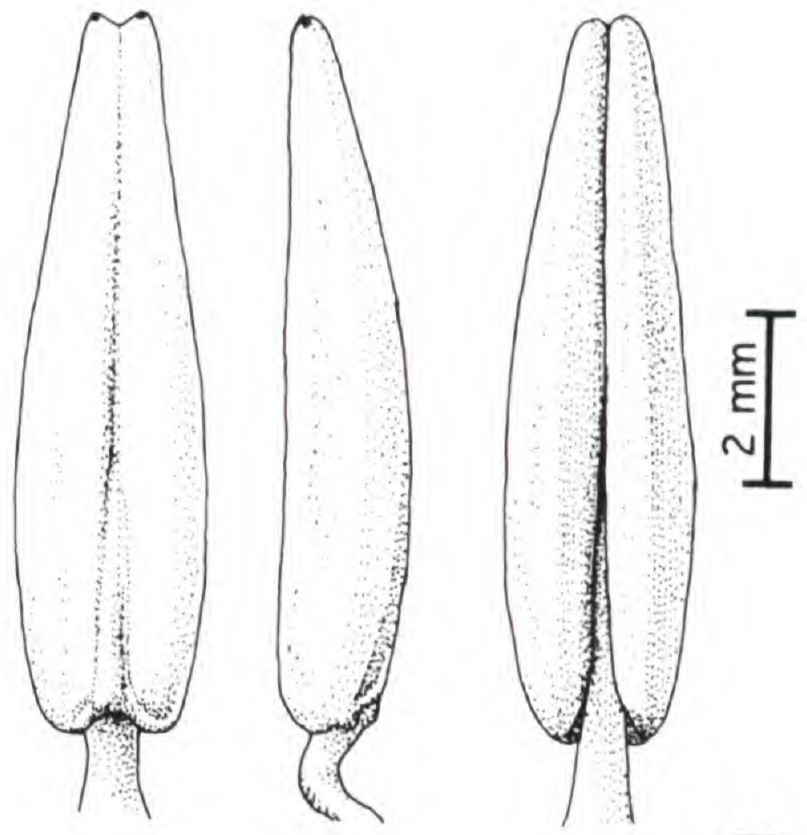
Small shrub 0.5–1 m tall with strong fetid odor. Young stems densely pubescent with unbranched or dendritically branched eglandular hairs and also some short-stalked glands; older stems medium-brown, sparsely to moderately pubescent, vertically furrowed with whitish fissures. Leaves 6–many per sympodial unit, the blades simple, chartaceous to subcoriaceous, acute at apex, cuneate to subcordate at base, ovate or elliptic, 4–12 cm long, 1.5–6.5 cm wide, length : width ratio ca. 1.5–3.3 : 1, sparsely pubescent adaxially with curled, white, usually dendritically branched hairs, these more dense on veins and margin, densely white-pubescent abaxially with dendritically branched hairs, the margin densely ciliate, the petioles 1–2.5 cm long, densely pubescent with hairs like those of the stem. Inflorescence unbranched (rarely forked), ca. 10-flowered, 1.5–5 cm long; peduncle 0.5–2 cm long; rachis 0.5–3 cm long; flowering and fruiting pedicels 10–15 mm long, spaced 1–5(10) mm apart, articulated at or near the base, leaving scars or short pegs less than 1 mm long; inflorescence axes sparsely to moderately pubescent with mostly unbranched hairs. Calyx sparsely to moderately pubescent, not constricted at apex of tube, the radius 3–5 mm, the lobes 1–3 mm long, ca. 2 mm wide, often unequally divided, deltate, with apiculate tips. Corolla violet, chartaceous, stellate, the radius 9 mm, the tube 2 mm long, the lobes 7 mm long, 2.5 mm wide at base, narrowly triangular, acute at apices, moderately to densely puberulent abaxially, sparsely puberulent adaxially, the margin densely ciliolate. Anthers usually connivent into a cone, yellow, lanceolate, somewhat sagittate at base, 5–7 mm long, 1.5–2 mm wide, glabrous; pores directed distally, not opening into longitudinal slits; filaments ca. 1 mm long. Ovary glabrous; style glabrous, cylindrical to subclavate, 7–8 mm long, 0.5 mm diam.; stigma truncate to subcapitate, the same diameter as the style. Fruits bright orange, globose, obtuse or slightly apiculate at apex, 1.5–2 cm long, 1.5–2.5 cm diam., glabrous; stone cell aggregates absent. Seeds prismatic, 4–5 mm long, 3–4 mm wide.

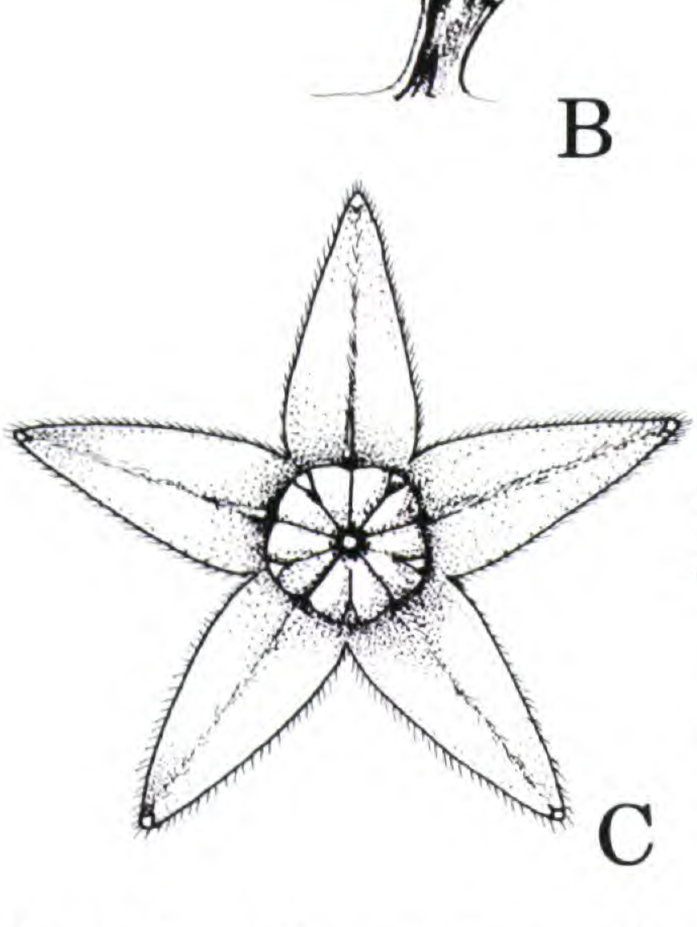
Phenology. Flowering specimens have been collected in December and February; fruiting specimens have been collected in February, March, and June.

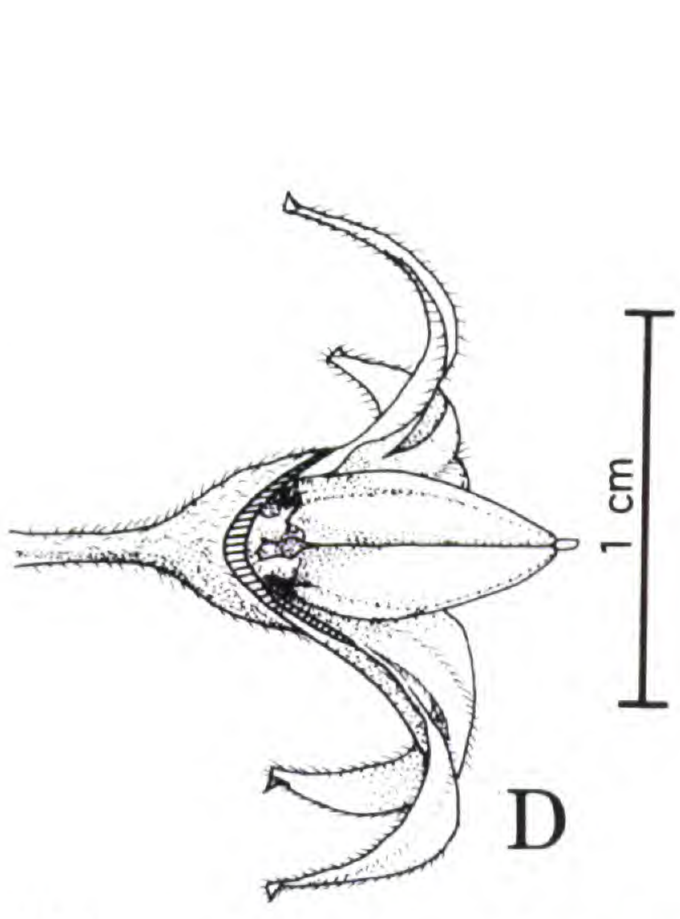
Distribution. Valley bottoms and gentle slopes in arid thorn scrub and shrubby dry forest, often in rocky, sandy, or grazed areas, 1,400–1,950 m in elevation, in the western part of Dept. Santa Cruz, Bolivia.











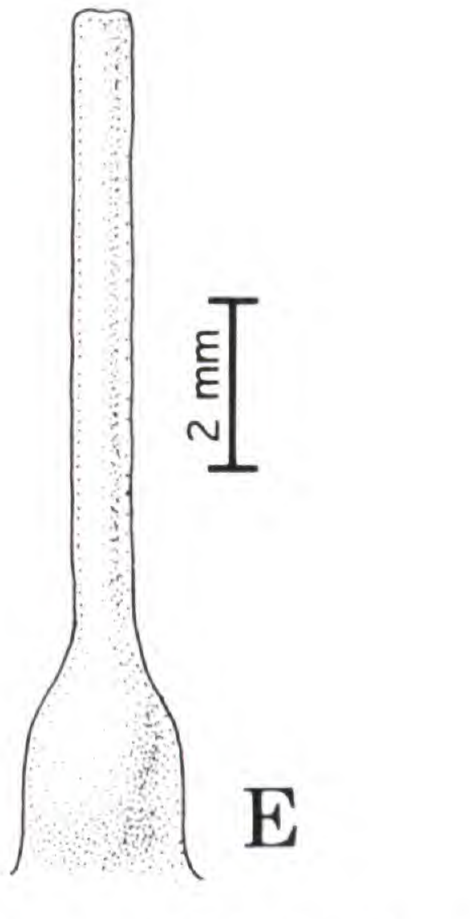


Figure 1. *Solanum hibernum* Bohs. —A. Habit. —B. Dendritically branched trichome from abaxial leaf surface. —C. Corolla (frontal view). —D. Corolla (side view). —E. Gynoecium. —F. Stamens (left to right: abaxial, side, adaxial view). —G. Fruit. All based on living material of *Nee s.n.*

Local names and uses. "Bolo bolo" (*Nee & Coimbra 33970*). Fruit not eaten due to its bitter taste (*Nee & Coimbra 33970*).

This species belongs to a putatively monophyletic clade of section *Cyphomandropsis* characterized by few-seeded fruits and large prismatic seeds. Other species belonging to this clade are *Solanum adelphum* Morton, *S. amotapense* Svenson, *S. confusum* Morton, *S. glaucophyllum* Desfontaines, *S. luteoalbum* Persoon, *S. nitidum* Ruiz & Pavón var. *hutchisonii* Macbride, *S. stuckertii* Bitter, and *Cyphomandra hypomalaca* Bitter. Although all the collections cited were originally distributed as *S. stuckertii*, *S. hibernum* is most similar to *S. luteoalbum*. Both species have abundant dendritic pubescence and violet corollas. *Solanum hibernum* differs in having the leaf surfaces strongly discolorous, with the upper surface dark green and the lower surface whitish green due to the lush covering of lanate arachnoid hairs. The short inflorescences also distinguish this species, as does its Bolivian distribution.

The name is taken from the Latin adjective *hibernus*, meaning "of the winter." This name was suggested by the artist, Alejandro Purgue, who, upon examining the dense leaf pubescence, declared that the plant "had its winter coat on."

All the collections cited were seen by the author, with the exception of the duplicate specimens at LPB and JBSC, which were examined by Michael Nee.

Paratypes. BOLIVIA. **Santa Cruz:** Prov. Vallegrande, 10 km by air NNW of Vallegrande, 18°23′S, 64°8′W, 1,850 m, 1 Feb. 1987 (fr), *Nee & Coimbra 33945* (NY); Prov. Vallegrande, Quebrada Llullucha, 14 km by air SSE of Mataral, 18°14′S, 64°11′W, 1,550 m, 1 Feb. 1987 (fr), *Nee & Coimbra 33950* (LPB, NY); Prov. Vallegrande, 6.5 km NNW of center of Vallegrande, 18°26′S, 64°7′W, 1,950 m, 9 Mar. 1988 (fr), *Nee & Solomon 36559* (LPB, NY); Prov. Vallegrande, Lagunillas, 5 km N of El Trigal on road to Mataral, 18°15′S, 64°9′W, 1,600 m, 24 Dec. 1989 (fl), *Nee 38328* (JBSC, UT); Prov. Florida, 2 km NE of Mairana, 18°7′S, 63°57′W, 1,450 m, 2 June 1991 (fr), *Nee s.n.* (no specimen), seeds grown at the University of Utah, Salt Lake City, Utah, as *Bohs 2443* (UT).

Acknowledgments. These studies were greatly enhanced by the living material obtained from seeds graciously sent by Michael Nee of the New York Botanical Garden. Thanks are also due to Alejandro Purgue for the illustration, to the curators at NY for the loan of specimens, and to the greenhouse staff at the University of Utah Biology Department for maintaining my living collections.

Literature Cited

Bohs, L. 1989. *Solanum allophyllum* (Miers) Standl. and the generic delimitation of *Cyphomandra* and *Solanum* (Solanaceae). Ann. Missouri Bot. Gard. 76: 1129–1140.

———. In press. *Cyphomandra* (Solanaceae). Flora Neotropica Monographs, New York Botanical Garden, Bronx, New York.

Moscone, E. A. 1992. Estudios de cromosomas meióticos en Solanaceae de Argentina. Darwiniana 31: 261–297.

Pringle, G. J. & B. G. Murray. 1991. Karyotype diversity and nuclear DNA variation in *Cyphomandra*. Pp. 247–252 *in* J. G. Hawkes, R. Lester, M. Nee & N. Estrada (editors), Solanaceae III; Taxonomy, Chemistry, Evolution. Royal Botanic Gardens, Kew.

A New Species of *Psychotria* Subgenus *Psychotria* (Rubiaceae) from Costa Rica

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ABSTRACT. An unusual new species with sessile inflorescences, *Psychotria turrubarensis* W. Burger & Q. Jiménez, is described and illustrated. It is only known from 1,600 m elevation in the Zona Protectora Cerro Turrubares of central Costa Rica.

Cerro Turrubares is a prominent mountain on the Pacific slope just southwest of Costa Rica's Meseta Central. This area experiences a dry season of approximately five months, December to April. The Zona Protectora Cerro Turrubares, below the elevation of 800 m, includes a transitional zone, where the lowland evergreen forests of the south intergrade with the deciduous forests of the north. The drier forest is characterized by *Bombacopsis quinata* (Jacquin) Dugand, *Cedrela odorata* L., *Tabebuia rosea* (Bertoloni) A. DC., and other species. This lower elevation area has been subjected to intensive use for farming and ranching.

A majority of the highlands that make up the Zona Protectora, including its highest peak (Cerro Bares, 1,756 m), support original evergreen forest. These forests contain species characteristic of Costa Rican forests between 800 and 2,000 m elevation, such as *Ulmus mexicana* (Liebmann) Planchon, *Quercus seemannii* Liebmann, and *Panopsis suaveolens* (Klotzsch & G. Karsten ex Klotzsch) Pittier. Access to these forests has always been difficult because of poor roads, and for this reason there have been few botanical collections from this area. Considering that these forests of higher elevation are relatively isolated from the Cordillera Volcánica Central and from the Cordillera de Talamanca, it is not surprising to find a new endemic species here. At present we know this species from only a single collection, but it possesses a number of unusual characteristics that, we believe, justify its recognition and description.

Psychotria turrubarensis W. Burger & Q. Jiménez, sp. nov. TYPE: Costa Rica. Prov. San José: Faldas del Cerro Bares, Zona Protectora Cerros de Turrubares, 9°47′30″N, 84°28′30″W, 1,600 m, 6 Nov. 1990 (fl, fr), *Q. Jiménez, R. Zúñiga & G. Varela 935* (holotype, CR; isotypes, F, MO). Figure 1.

Frutex ca. 4 m altus, omnino glaber, stipulibus 12–16 mm longis, lanceolatis (late ovatis subter inflorescentiis), caducis. Foliae oppositae, interdum quaternae, petiolis 5–18 mm longis; laminae 7–13 cm longae, 3–6.5 cm latae, ellipticae vel elliptici-obovatae, nervis secondariis 5–9 paribus, foveis domatiorum glabris. Inflorescentiae sessiles solitariae, terminales vel pseudo-axillares, 8–16 mm longae, basi tomentulosae. Flores sessiles, calyce tomentulo, corolla alba, tubo usque 5 mm longo, lobulis 5, ca. 3 mm longis. Fructus 7–8 mm longi, 6–9 mm lati, rubri, sessiles; pyrena pagina interna plana.

Shrubs, ca. 4 m tall, leafy stems 1.3–3.5 mm thick, glabrous, drying pale grayish; stipules 12–16 mm long, 3–4 mm broad at the base, lanceolate, forming a calyptrate sheath over the shoot apex and splitting along one side (broadly ovate and ca. 10 × 10 mm below the developing inflorescences), drying dark reddish brown, caducous, with thin deciduous reddish hairs interior to the base of the stipule. Leaves opposite or apparently in a whorl of 4 when an internode fails to elongate, petioles 5–18 mm long, 1.1–2.3 mm broad, glabrous and drying dark, flat or sulcate above; leaf blades 7–13 cm long, 3–5.5 (6.5) cm broad, elliptic to elliptic-obovate or elliptic-oblong, acute to bluntly obtuse at the apex, acute to cuneate at the base and slightly decurrent on the petiole, drying stiffly chartaceous and grayish above (similar beneath), glabrous above and below, venation eucamptodromous, with 5–9 major secondary veins on each side, central secondaries arising at angles of 40°–60°, deep rounded pit-domatia (0.2–0.4 mm broad) usually present at the vein axils beneath. Inflorescences terminal or pseudoaxillary,

Figure 1. *Psychotria turrubarensis* W. Burger & Q. Jiménez. Three twigs from an isotype collection (F) with centimeter scale. Center left, an enlarged view of an inflorescence. Bottom left, abaxial (dorsal) and adaxial surfaces of the pyrene. (Millimeter scale applies to enlarged inflorescence and pyrenes.) Bottom right, an enlarged view of the domatia. Drawn by the senior author.

solitary, sessile capitula, 8–16 mm long, 10–15 mm broad, at first enclosed by the broad bracteate stipules, with 10–20 flowers, bracteoles to 2 mm long, difficult to see among the tomentulous hairs, flowers sessile or subsessile. Flowers 5-parted, buds with corolla-tips separate distally, hypanthium/ovary ca. 1 mm long, calyx with tomentulous yellowish hairs, calyx lobes ca. 1 mm long; corolla white, salverform, glabrous on the outside, corolla tube to 5 mm long, 2 mm diam. distally, with dense thin hairs within the throat, corolla lobes ca. 3 mm long and 1 mm broad, usually with a thickened rounded abaxial expansion on the tip ca. 0.3 mm diam.; style exserted 2 mm. Fruits 7–8 mm long, 6–9 mm thick, subglobose, red at maturity and subsessile, surface smooth; pyrenes 7 × 6.5 mm, flat on the inner

(adaxial) face, with 5 longitudinal sulci on the rounded abaxial (dorsal) surface.

Distribution. The species is only known from the type collection, collected in the understory of evergreen forest at 1,600 m elevation. Some species observed growing in association with the new species are: *Citronella costaricensis* (J. D. Smith) R. Howard, *Hoffmannia longipetiolata* Polakowsky, *Ocotea valeriana* (Standley) W. Burger, *Pisonia sylvatica* Standley, *Sorocea trophoides* W. Burger, and *Ulmus mexicana* (Liebmann) Planchon.

Psychotria turrubarensis is distinguished by its small sessile capitate inflorescences, united stipules forming a calyptrate sheath over the vegetative shoot apices, glabrous vegetative parts, well-developed pit-domatia, and the wartlike protuberance at the tips of the corolla lobes. Hairs are present only at the throat of the corolla and on the calyx and inflorescence. The reddish (when dried) hairs at the adaxial base of the stipules, red fruit, and leaves drying grayish are characteristics of subgenus *Psychotria*. The presence of pit-domatia also characterizes a number of Costa Rican species of subgenus *Psychotria;* pit-domatia are rarely present in Central American species of subgenus *Heteropsychotria*. The glabrous pit-domatia have well-defined, slightly elevated, rounded edges and are quite deep. A few have the bodies of small ants tightly packed within, as if they had been forced into the cavity.

Because of the lack of inflorescence branching, this species is difficult to place within Hamilton's (1989) groupings of Mesoamerican species of subgenus *Psychotria*. The flat or slightly concave inner (adaxial) surface of the pyrene, lacking a longitudinal sulcus, is also an unusual trait within subgenus *Psychotria*. The deep pit-domatia are similar to those of *P. remota* Bentham, but smaller. We regret that we were not able to publish this species in a more timely fashion, as was originally planned (cf. Burger & Taylor, 1993: 277).

Literature Cited

Burger, W. & C. M. Taylor. 1993. Family #202, Rubiaceae. *In:* Flora Costaricensis. Fieldiana, Bot. n.s. no. 33: 1–333.

Hamilton, C. 1989. A revision of Mesoamerican *Psychotria* subgenus *Psychotria* (Rubiaceae), Part I: Introduction and species 1–16. Ann. Missouri Bot. Gard. 76: 67–111; Part II: Species 17–47. Ann. Missouri Bot. Gard. 76: 386–429; Part III: Species 48–61 and appendices. Ann. Missouri Bot. Gard. 76: 886–916.

A New Species and a New Name in *Rosa* (Rosaceae) from China

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ABSTRACT. *Rosa alexandrae* Buzunova (sect. *Synstylae* DC.) is described. The new name *R. uniflorella* is proposed to replace the later homonym *R. uniflora* Yu & Ku.

Among the collections made by G. N. Potanin from China and deposited at the Komarov Botanical Institute (LE), there is an undescribed species of *Rosa*. It is named here for his wife, A. V. Potanina, who accompanied him during his expedition to China and Mongolia.

Rosa alexandrae Buzunova, sp. nov. TYPE: China. Gansu: valley of Pei-schui, near Litschapu, 19 June 1885 (fl), *G. N. Potanin s.n.* (holotype, LE). Figure 1.

Frutex altus; aculei 4–5 mm longi, aduncti. Foliola 3–5, 2–3(–4) cm longa, 1.5–2 cm lata, elliptica vel obovata, margine simpliciter dentata. Flores albi, 9–11 depositi, 1.5–2 cm in diam., bracteati. Pedicelli 1–1.5 cm longi, glanduloso-setulosi. Sepala integerrima, 6–7 mm longa, ovato-lanceolata, dorso plerumque pilosa et glandulosa. Styli coaliti; columna stylaris 4–5 mm per orificium disci excedens, dense pilosa. Hypanthia globosa vel late ellipsoidea, 3–4 mm in diam., glabra. Fructus ignoti.

Tall-growing shrubs with erect or flexuous branches. Cortex reddish. Prickles 4–5 mm long, sparse, ± uniform, hooked, with a dilated base. Leaves 6–8 cm long, rachis densely pubescent, glandular, prickly; stipules 8–10 × 1–1.2 mm, entire at margin, with acuminate auricles 2–3 mm long, usually diverging. Leaflets 3–5, 2–3(–4) × 1.5–2 cm, broadly ovate or obovate, glabrous or sparsely pubescent adaxially, densely pubescent and sometimes sparsely glandular abaxially, base rounded to cuneate, margin uniserrate with short and broad teeth, apex obtuse. Corymbs loose, usually 9–11-flowered; bracts rather short, entire, pubescent. Flowers white, 1.5–2 cm diam. Pedicels 1–1.5 cm long, glabrous or pubescent, usually glandular-hispidous. Sepals entire, 6–7 mm long, ovate-lanceolate, acuminate, pubescent and glandular on the back. Styles connate in a pubescent column up to 4–5 mm long. Hypanthia globose to ovoid, 3–4 mm diam. Fruit unknown.

Rosa alexandrae apparently does not have close relatives among the 18 Chinese species of section *Synstylae*, especially the three species with 3–5-foliolate leaves and entire stipules, with which it should be associated. It is probably remotely related to *R. weisiensis* Yu & Ku, which is readily distinguished from *R. alexandrae* by its straight, basally dilated prickles and narrower leaflets.

Rosa uniflorella Buzunova, nom. nov. Replaced name: *Rosa uniflora* Yu & Ku, Bull. Bot. Res. North-East. Forest. Inst. 1(4): 12. 1981, not Galushko Bot. Mater. Gerb. Bot. Inst. Komarova Akad. nauk SSSR 19: 204–217. 1959: 212. TYPE: China. Zhejiang: Daishan Xian, *L. C. Chiu & R. L. Lu 9605* (holotype, HP).

The Chinese *Rosa uniflora* Yu & Ku is a later homonym of the Caucasian *R. uniflora* Galushko. Therefore, a new name is proposed for the Chinese plant.

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Figure 1. Photograph of the holotype of *Rosa alexandrae* Buzunova (LE).

Philodendron Subgenus *Pteromischum* (Araceae) from Saül, French Guiana

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ABSTRACT. This paper treats the six species of *Philodendron* subg. *Pteromischum* from Saül, a region of mostly virgin humid forest located in central French Guiana. Descriptions, dichotomous keys, discussion, and exsiccatae are provided. Three species, *P. cremersii*, *P. duckei*, and *P. guianense*, are new.

Work toward the completion of the Araceae treatment for the Flora of Saül has resulted in the resolution of several unidentified species of *Philodendron* subg. *Pteromischum* from the Guianas. This treatment is to appear in a work currently in preparation by Scott Mori et al. entitled *Flora of the Central French Guiana: A Manual of the Vascular Plant Families of Lowland Moist Forest in Northeastern South America*, to be published by the New York Botanical Garden. The publication schedule of that treatment demands the publication of several novelties at this time. Because subgenus *Pteromischum* is very rich and confusing in the Guiana region, and the Flora of Saül treatment does not allow detailed descriptions, the publication of detailed descriptions for all the species in the Saül region is warranted.

KEY TO SPECIES OF SAÜLIAN *PHILODENDRON* SUBG. *PTEROMISCHUM*

1a. Leaf blades lacking any obvious primary lateral veins; entire spathe abscissing immediately after anthesis ..... *P. surinamense* (Miquel) Engler
1b. Leaf blades with obvious primary lateral veins (at least near the base); spathe persisting after anthesis (at least until maturity of fruits).
  2a. Leaf blades more than 30 cm long and usually more than 13 cm wide (more than 6.5 cm wide in juveniles); spathe 14–17 cm long ..... *P. cremersii* Croat & Grayum
  2b. Leaf blades less than 23 cm long and usually less than 12 cm wide; spathe 6–12.5 cm long.
    3a. Petiole sheath ending somewhat below the base of the blade ..... *P. guianense* Croat & Grayum
    3b. Petiole sheath ending at base of blade.
      4a. Petioles so narrowly winged as to almost appear unwinged, the wing erect or involute, 3–4 mm wide when flattened; blades dark green and velvety above; stems distinctly scaly-puberulent or scaberulous ..... *P. duckei* Croat & Grayum
      4b. Petioles conspicuously winged, the wing spreading, 9–10 mm wide; blades medium green and semiglossy to glossy above; stems smooth or at most minutely granular-puberulent at 30× magnification.
        5a. Blades glossy on lower surface; plants nearly always growing up tree trunks in a spiral fashion, usually producing 2–3 spirals before branching and flowering; spadix slender ..... *P. placidum* Schott
        5b. Blades matte on lower surface; plants usually growing straight up the side of tree trunks before branching and flowering; spadix stout ..... *P. rudgeanum* Schott

Philodendron cremersii Croat & Grayum, sp. nov. TYPE: French Guiana. Montagnes de Kaw, along road to Montagne Favard, in vicinity of junction to Fourgrassie, 04°38′N, 52°17′W, 200 m, *Croat 74336* (holotype, MO-4343662; isotypes, B, CAY, F, K, MG, NY, P, US, VEN). Figures 1, 2.

Planta hemiepiphytica; internodia 1–9(17) cm longa; petiolus (6)13–27 cm longus, vaginatus usque 1.2–1.7 cm infra laminam; vagina erecta; lamina plus minusve elliptica, 30–50.5 cm longa, 9–20 cm lata, nervis primariis lateralibus ca. 20 utroque; pedunculus usque 3 cm longus; spatha 14–17 cm longa; spadix 11–16.5 cm longus; parte pistillata usque 5 cm longa.

Hemiepiphyte, on tree trunks near the ground. Stems sometimes trailing when preadult, appressed-climbing when adult. Internodes 1–9(17) cm long, (0.5)1–1.5 cm diam., dark green to bluish green, matte to weakly glossy, flattened on one side, drying light yellow-brown to medium reddish brown, drying

Figures 1, 2. *Philodendron cremersii* Croat & Grayum, *Croat 74336*. —1. Habit. —2. Flowering plant showing erect-incurled sheath and short-pedunculate inflorescence.

narrowly ridged (sometimes irregularly so on juveniles). Petioles to 27 cm long, sheathed to within 1.2–1.7 cm of the base of the blade on adult plants (to beyond the base of the blade on juveniles); sheath narrow (the sides ca. 5 mm high), to 10 mm or more wide when flattened, erect-incurled, overlapping at base, erect and incurled toward apex, emarginate and free-ending at apex, dark green and matte, the surface drying finely striate. Blades somewhat inequilateral, one side 0.5–4.3 cm narrower, ± elliptic, rarely narrowly oblanceolate, 6.5–21 cm long, 6.5–13 cm wide when young, usually narrowly oblanceolate, 30–50.5 cm long, 9–20 cm wide, ca. 3 times longer than wide (rarely as little as 1.8 times longer than wide), acuminate at apex, equilateral or only slightly inequilateral and acute to narrowly rounded at base, subcoriaceous, dark green and subvelvety matte when young, becoming weakly glossy when mature, moderately paler and semiglossy below (matte when juvenile), becoming semiglossy, usually drying dark brown above, lighter brown below; margins broadly undulate; midrib obtusely sunken and concolorous to slightly paler above, narrowly raised below (sometimes convex on juveniles) and paler below. Primary lateral veins to ca. 20 per side on adults (5–9 on juveniles), arising at 55–80° angle (45–55° on juveniles), weakly arcuate, weakly quilted-sunken above, weakly raised to convex and paler below, sometimes weakly pleated, drying darker than surface below. Minor veins sparse, moderately distinct below, drying weakly raised and somewhat undulate with rather prominent oblique cross veins. Inflorescences 1–2 per axil. Peduncle to 3 cm long, largely hidden by the spathe. Spathe 14–17 cm long, slightly constricted above the tube. Spathe tube medium green outside, blade pale green to whitish, the entire inner surface greenish white. Spadix 11–16.5 cm long; female portion of spadix pale green, to 5 cm long in front, 4.7 cm long in back, to 2 cm diam. midway, 1.8 cm diam. at apex, 1.7 cm diam. at base.

Philodendron cremersii is apparently endemic to French Guiana, known principally from the Montagnes de Kaw at 100–250 m. It is common along the road to Montagne Trésor east of Cayenne. It is also known from a single collection along the road between Cayenne and Regina.

The species is recognized by its very large, dark brown-drying leaf blades, erect petiole sheath extending nearly to the apex, yellowish brown-drying stem, and the semiglossy upper blade surfaces. It is

named in honor of Georges Cremers, a long-time researcher at ORSTOM in French Guiana. He has made many excellent collections of Araceae, including the first collection of this species.

Plants believed to represent *P. cremersii* are also relatively common around Eaux Claires near Saül in central French Guiana, but were seen only in sterile and probably juvenile condition on the lower trunks of trees in the forest understory. The Saül material (*Croat 74165* and *74234*) differs in having blades that are subvelvety above and matte below (drying gray-green above, slightly yellow-green below, with the epidermal cells sunken on both surfaces), in contrast to weakly glossy for the fertile collections seen in the Montagnes de Kaw. It is likely that these differences are merely due to age.

Philodendron cremersii is similar to *P. macropodum* K. Krause described from Brazil (Roraima: Serra de Mairary at 1,000 m). That species also has a petiole sheath that ends somewhat below the blade, but it has smaller leaves which are more nearly elliptic and dry gray-brown above and reddish brown below. In addition, they are broadly rounded at the base (vs. narrowly rounded to acute for *P. cremersii*).

Philodendron cremersii is easily confused with another incompletely known but apparently new species from French Guiana and Surinam. That species has blades that are typically more ovate, averaging about twice as long as broad (vs. an average of 2.5 times longer than broad in *P. cremersii*). It also differs in having blades that are matte when fresh (also expressed in larger epidermal cells on the upper surface of the blade), which dry yellowish brown rather than dark brown and lack the oblique cross veins common to *P. cremersii*. The species is represented by material from Ile de Cayenne (*Oldeman 1117*), Montagnes de Kaw (*Billiet & Jadin 1986*, *Cremers & Feuillet 1970*, *Croat 74254*), and along the St. Elie track (*Croat 53849*). It is probably also represented in Surinam at Brownsberg Park (*Croat 53902*).

Paratypes. FRENCH GUIANA. Montagnes de Kaw, 100 m, *Cremers 9828* (B, CAY, K, NY, P, U, US); Montagnes de Kaw, caves of Kaw, along road to Montagne Trésor, ca. 10 km E of Camp Caïmans, 4°34′N, 52°10′W, 100 m, *Croat 74270* (CAY, MO); along road to Montagne Trésor, caves of Kaw, ca. 10 km E of Camp Caïman, 5 km N of road, 100 m, 4°34′5″N, 52°10′00″W, *Croat 74254* (CAY, MO); Montagnes de Kaw, N slope, 2–3 km N of Camp Caïman, 100 m, *de Granville 6700* (CAY); Montagnes de Kaw, along road to Montagne Favard, vic. jct. to Fourgrassie, 4°38′N, 52°17′W, 200 m, *Croat 74336* (B, CAY, F, K, MG, MO, NY, P, US, VEN); Cayenne–Regina, km 93, 100–150 m, *Croat 74322* (MO).

Philodendron duckei Croat & Grayum, sp. nov. TYPE: French Guiana. Mt. Galbao, south sector, 570 m, 3°35′N, 53°18′W, *de Granville et al. 8894* (holotype, US; isotypes, CAY, K, NY, P). Figures 3, 4.

Planta hemiepiphytica; internodia 1–5(8) cm longa, 3.5 mm diam.; petiolus 3–7 cm longus, omnino vaginatus; lamina oblongo-elliptica, 6.5–21 cm longa, supra hebetata, subvelutinave; nervis primariis lateralibus 9–13 utroque; inflorescentia solitaria; pedunculus 1.5–2 cm longus; spatha 7–8 cm longa; spadix 6.5–8 cm longus, parte feminina 2.2 cm longa.

Terrestrial or hemiepiphytic near the ground. Internodes purplish to brownish, semiglossy, terete, 1–5(8) cm long, 3–5 mm diam., drying dark brown, sharply ribbed, densely and minutely scaly-scaberulous (sometimes smooth in age; merely scaberulous in material from Saül). Petioles 3–7 cm long, sheathed throughout, the sheath matte, erect and incurled, 3–4 mm wide when flattened, closely striate, the striae and lower part of lower midrib often densely scaberulous, sheath apex rounded and slightly overlapping base of blade. Blades slightly inequilateral, one side 7–11 mm narrower, oblong-elliptic, 6.5–21 cm long, 2.5–7 cm wide, gradually acuminate at apex, acute to narrowly rounded or weakly cordulate at base, thin, dark green, matte and subvelvety above, slightly paler and matte below, drying grayish to olive-green above, yellowish gray-green to yellowish brown below. Major veins sunken above, slightly paler and matte below; major veins raised below. Midrib and primary lateral veins sunken above; midrib prominently raised and slightly paler below, drying brownish; primary lateral veins 9–13 pairs, arising at 50–60° angle, weakly arcuate to margin, ± pleated-raised below, drying slightly paler than the surface. Minor veins fine, distinct. Inflorescence 1 per axil. Peduncle 1.5–2 cm long, less than 3 mm diam. when dried. Spathe 7–8 cm long, 7–15 mm diam., weakly constricted just above the tube, the tube 1.5–1.7 cm diam. Spadix 6.5–8 cm long, the pistillate part 2.2 cm long, 6 mm diam.; staminate portion to 3.2 cm long, < 3 mm diam. on drying throughout. Infructescence 2.5–3.5 cm long, drying 10–15 cm diam.

The species ranges from French Guiana to northeastern Brazil (Amapá and Pará) to as far south as 4°11′S, at elevations of 60 to 580 m. It is characterized by its thin, subelliptic, dark green blades subvelvety on the upper surface and the slender, fully winged petiole. It was first collected in French Guiana by Joseph Martin. It is named in honor of Adolfo Ducke, who made important collections in the Amazon basin between 1912 and 1947. He was

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the first to have collected this species in Brazil (19 November 1910).

Paratypes. BRAZIL. **Amapá:** Municipio Oiapoque, 121 km SSE of Oiapoque on BR 156, near edge of Reserva Indigena Uaçá, ca. 3°00′N, 51°30′W, *Daly & Souza 3830* (NY). **Pará:** BR 422, 70 km SSW of Tucuruí, 4°11′S, 49°44′W, *Daly et al. 1494* (MG, MO); Rio Tocantins, Igarapé Cametaú, entrance Itupiranga, 4°09′S, 49°17′W, *Daly et al. 1562* (MG); Santarém, km 61 along road to the Palhâo waterfalls, on Rio Curuá, Rio Guminá-Mirim, Castenhal das Piedras, *Ducke 11471* (MG). FRENCH GUIANA. Locality unknown: *Martin s.n.* (K, mistakenly labeled type of *P. guttiferum* var. *rudgeanum*); Approuague river basin–Arataye, 4°3′N, 52°42′W, 90 m, *Larpin 803* (CAY, MO); Camopi River (tributary of Oyapock), 2 km from Crique Tamouri, *Oldeman 143* (CAY, P); Camopi River, Saut Ouasseye, *Oldeman 2603* (CAY, P); Gobaya Soula–Maroni River basin–trail to Atachi–Bacca, l'Itany River, *de Granville 10392* (CAY); Mont Galbao, 570 m, 3°35′N, 53°18′W, *de Granville et al. 8894* (CAY, US); Ile de Cayenne, Mont Grand Matoury, 50 m, *Cremers 1993* (CAY, MO); Oyapock River, 2 km from Camopi, *Oldeman 2732* (CAY, P), *2737* (CAY,P); Montagne Bellevue de l'Inini, 700 m, *de Granville 7981* (CAY); Région de Paul Isnard, Massif du Décou, 580 m, *Feuillet 389* (CAY, K); Saut Pararé, Arataye River, affluent of Approuague River, 7 km SW of Regina, *Villiers 2720* (CAY); Saül, *Riera 947* (CAY); Saül, ORSTOM trail, Boef Mort trail, p.k. 1,200, *de Granville 894* (CAY, P, US); Saül, vic. Eaux Claires, *Croat 74142* (CAY, MO), *74185* (CAY, MO); Yaroupi River, Saut Polissoirs, *Oldeman 3062* (CAY); Yaroupi River, 6 km from Saut Taïnoua, *de Granville 395* (CAY). SURINAM. Massau Mts., Marowijne River, 400–520 m, *Cowan & Lindeman 39024* (NY).

Philodendron guianense Croat & Grayum, sp. nov. TYPE: Surinam. Emmaketen Mountains, south track, ca. 1 km S of division point, cloud forest, 825 m, *Daniëls & Jonker 1061* (holotype, NY; isotypes, K, U). Figures 5, 6.

Planta hemiepiphytica; internodia 2–6 cm longa, 3–5 mm diam.; petiolus 6.5–10.5 cm longus; vagina terminans 6–15 cm infra laminam; lamina oblonga-elliptica vel anguste obovata, 9–21 cm longa, 3–7.5 cm lata; nervis primariis lateralibus 3–5(7) utroque; pedunculus 2.5–3 cm longus; spatha 6–8 cm longa, non constricta supra tubum, viridis vel flavum omnino; spadix 5–7.5 cm longus, parte pistillata 2–3.7 cm longa.

Hemiepiphytic vine. Internodes 2–6 cm long, 3–5 mm diam., dark green to olive-green or grayish, turning light brown, semiglossy, weakly flattened on one side, drying light yellow-brown to dark brown. Petioles 6.5–10.5 cm long, medium green and weakly glossy, darker along the margins, sheathed from ⅔ its length to nearly throughout but ending 6–15 mm below the blade, sometimes to the base of the geniculum, narrow, erect and incurled, the margins touching toward the base, typically less than 5 mm high, to ca. 8 mm wide when flattened (to 1 cm wide when subtending inflorescence), narrowly rounded at the apex, the free portion of the petiole and the geniculum sharply sulcate. Blades thinly coriaceous, slightly to moderately inequilateral, oblong-elliptic to narrowly obovate, 9–21 cm long, 3–7.5 cm wide, gradually to abruptly acuminate at apex, slightly inequilateral and acute at base, subcoriaceous, dark green and weakly subvelvety matte to weakly glossy above, slightly to moderately paler and matte below, drying gray-green above, yellow-green below. Midrib deeply sunken and concolorous above, narrowly convex and slightly paler below. Primary lateral veins 3–5(7), weakly visible and weakly sunken above, flat and weakly pleated-raised below, scarcely more visible than minor veins (only slightly wider at times), arising at 45–50° angle, drying paler than surface, sometimes weakly undulate, gradually arcuate to margins. Minor veins visible but usually weak and thin. Inflorescence solitary. Peduncle slender, mostly exposed, 2.5–3 cm long, drying less than 3 mm diam., reddish brown. Spathe 6–8 cm long, 1–2 cm diam., not at all constricted above the tube, solid green to yellowish, slightly paler within, drying reddish brown. Spadix 5–7.5 cm long. Pistillate portion 2–3.7 cm long, 8–10 mm diam. Staminate portion weakly protruded forward, slender, with a small portion remaining exposed on drying.

Philodendron guianense ranges from Guyana (doubtless Venezuela as well since it has been collected very near the Venezuelan border (*Stergios et al. 3371*)) to Surinam, French Guiana, and Brazil (Amapá at 2°12′N), 100–900 m elevation.

Steyermark 87586 from Venezuela (Delta Amacuro, Río Cuyubini, Cerro La Paloma in the Sierra Imataca at 100–200 m) is perhaps also this species. However, it differs in having the petioles sheathed all the way to the geniculum.

The species is characterized by its usually oblong-elliptic, frequently subvelvety matte blades, petiole sheath ending somewhat below the leaf blade, and inflorescence with a small apical portion remaining exposed after drying. The name of the species reflects its primarily Guianan distribution.

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Figures 3–6. 3, 4 *Philodendron duckei* Croat & Grayum, *Croat 74142*. —3. Habit. —4. Showing narrowly sheathed petiole and matte blade. 5, 6. *P. guianense* Croat & Grayum, *Croat 74235*. —5. Habit, growing over large rock. —6. Habit, growing over ground.

Some collections (*Grenand 1626* (CAY) collected at Oyapock: Anse Bruyère and *Daniëls 48* (CAY) collected at Grand Santi) were collected on opposite sides of French Guiana. They are tentatively placed here but perhaps represent another species. They differ in having narrower blades that dry dark brown and have primary lateral veins departing the midrib at ca. 25° angle.

Paratypes. BRAZIL. **Amapá:** Rio Oiapoque, near Cachoeira Tres Saltos, 2°12′N, 52°53′W, *Irwin, Pires & Westra 48137* (NY). FRENCH GUIANA. Without locality, *Moricand s.n.* (G); Maroni–Camp Charveiu, *Lemée s.n.* (P); road to St. Elie, CD–21, km 15.7, 5°00′N, 53°10′W, *Hahn 3696* (US); road to Kaw, km 34, 340 m, *Billiet & Jadin 4593* (BR); Régina–St. Georges D.Z. 5–km 43–Ba River basin, *Cremers 1991* (CAY); Rte. RN 2, p.k. 53, Crique Boulanger, *Billiet & Jadin 4464* (BR); Saül, vic. Eaux Claires, 230 m, *Croat 74174, 74195, 74235* (CAY, K, MO); 2 km S of Saül, track Limonade, 3°32′N, 53°12′W, 180–210 m, *Ek & Montfoort 4* (CAY). SURINAM. Emmaketen, E slope of Gonggrijptop, 900 m, *Daniëls & Jonker 932* (U); Emmaketen, south track, 825 m, *Jonker-Verhoef & Jonker 1061* (K, NY, U); road to Petit Saut, *Sauvain 654* (CAY). GUYANA. Bartica–Potaro Road, 14–15 km, *Sandwith 1154* (K); Akarabisí, a few meters from the Venezuelan border, 6°57′N, 60°22′W (MO, PORT); Upper Rupununi River, near Dadanawa, 2°45′N, *La Cruz 1521* (NY).

Philodendron placidum Schott, Bonplandia 7: 164. 1859. *Philodendron guttiferum* Kunth var. *placidum* (Schott) Engler in Martius, Fl. Bras. 3(2): 149. 1878. TYPE: French Guiana. Cayenne: *Martin s.n.* (holotype, G-DC). Figures 7, 8.

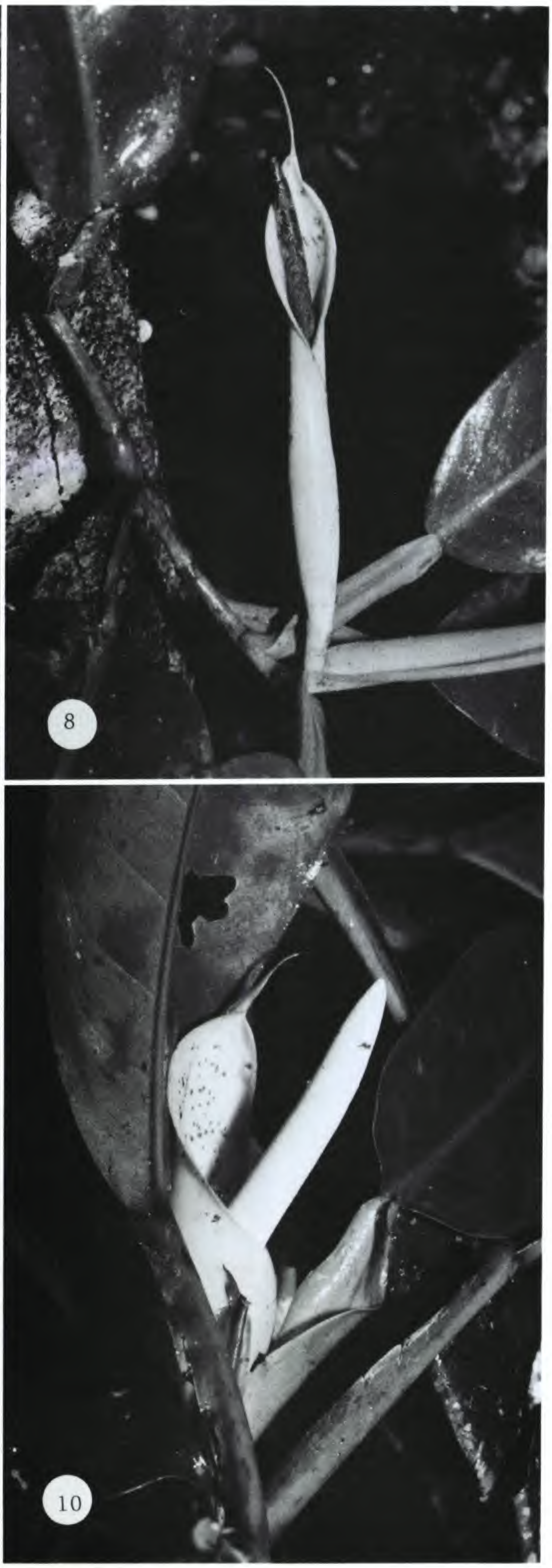
Hemiepiphytic appressed climber spiraling around the tree trunk several times below ca. 5 m, where it branches and spreads before flowering. Internodes 3–5 cm long (to 16 cm on younger stems), 4–6 mm diam., matte, dark green, becoming gray, sharply flattened on one side, drying pale yellow-brown with close, slender ridges, smooth but obscurely and densely granular-puberulent at 30×. Petioles 6.5–11 cm long, sheathed throughout, the sheath 9–15 mm wide, glossy, spreading, truncate to emarginate at apex, drying reddish brown. Blades 12–31 cm long, 5–12.7 cm wide, oblong-elliptic or rarely elliptic, markedly inequilateral (one side 1.5–2.7 cm narrower), abruptly acuminate at apex, narrowly and inequilaterally rounded at base, subcoriaceous, glossy on both surfaces, moderately bicolorous, drying grayish above, yellowish brown beneath. Midrib weakly sunken above, convex below, often drying undulate. Primary lateral veins 7–10, weakly sunken above, weakly raised below, drying paler than surface, arising at ca. 30° angle on the narrow side, at ca. 45° on the broader side, weakly arcuate to the margin. Minor veins drying moderately distinct below. Inflorescence 1 per axil. Peduncle 1–2 cm long, drying 4–6 mm diam. Spathe 9.5–12.5 cm long, barely constricted above the tube, the tube pale green, the blade white, caudate-acuminate at apex (the acumen to 2 cm long), with reddish brown resin droplets on inner surface, becoming greenish throughout after anthesis, with the upper 3 cm of the spadix remaining open after anthesis and with the post-anthesis spadix remaining exserted 1–2.5 cm, the entire spathe drying reddish brown after anthesis. Spadix 9.5–11.5 cm long, the staminate portion narrowly long-tapered, to 6 mm diam.

Philodendron placidum is apparently widespread in French Guiana, has been collected near the Surinam border at Crique Grégoire, and is to be expected in Surinam. This species is abundant everywhere in the vicinity of Eaux Claires near Saül in south-central French Guiana.

The species is recognized by its spirally climbing growth habit, its fully sheathed petioles, blades glossy on both surfaces, and by its stubby inflorescence with the spadix remaining slightly exserted after anthesis. It is very easily confused with *P. rudgeanum* Schott, which differs in climbing directly up the side of the tree, and in having blades that are matte rather than glossy on the lower blade surfaces, a slender spadix, and in generally flowering ahead of *P. placidum*. It was rarely at anthesis during mid-February, whereas many plants of *P. placidum* were in flower.

Though there are a number of older collections of this species from the Guianas, the name has long been applied only to a Schott drawing (2413) and the holotype in Geneva, which may not be borrowed. However, careful studies of the drawings as well as photographs of the type specimen strongly suggest that it represents the material here described. Schott's drawing of the spathe shows it to be subelliptic and open at anthesis with the male portion of the spadix somewhat protruding forward. While the inflorescence at anthesis has not been seen at Saül, the proportions of the respective spadix portions agree with the Schott drawings.

Specimens seen. FRENCH GUIANA. Without locality: without collector (G); Crique Grégoire, ORSTOM Hydrological Station, *Deward 15* (CAY); Saül, 3°37′N, 53°12′W, 200–400 m, *Mori & Pipoly 15599* (CAY); Saül, trail between Mont Galbao trail and Crique Limonade Trail, 200 m, 3°37′N, 53°12′W, *Mori et al. 20827* (CAY); Saül, vic. Eaux Claires, 240 m, *Croat 74136* (B, CAY, F, K, MG, MO, NY, P, US, VEN), *74192* (CM, MO); Saül, Monts la Fumée, 3°37′N, 53°12′W, *Mori & Boom 15331* (CAY); Saut Mapaou–Approuague River basin, 4°12′N, 52°18′W, *Cremers 13026* (CAY, MO); Trois



Figures 7–10. 7, 8. *Philodendron placidum* Schott, *Croat 74136*. —7. Habit, showing spiral growth up a tree. —8. Close-up showing post-anthesis inflorescence with a portion of the spadix remaining exserted. 9, 10. *Philodendron rudgeanum* Schott, *Croat 74130*. —9. Habit, showing plant growing straight up the side of the tree. —10. Close-up showing short-pedunculate inflorescence at anthesis.

Figures 11, 12. *Philodendron surinamense* (Miquel) Engler, *Croat 74189*. —11. Habit. —12. Leaf blade showing lack of prominent primary lateral veins.

Sauts–road between Zidok and Capitaine Roger, *Lescure 554* (CAY); Saut Koumaou Soula, S of Tampoc, *Cremers 4458* (CAY).

Philodendron rudgeanum Schott, Syn. Aroid. 78. 1856. *Philodendron guttiferum* Kunth var. *rudgeanum* (Schott) A. Jonker & Jonker in Pulle & Lanjouw, Fl. Suriname 1(2): 73. 1953. TYPE: t. 33 in Rudge, Pl. Guian. 1(4). 1805 (holotype). Figures 9, 10.

Pothos cannifolius Rudge [as "*cannaefolia*"], Pl. Guian. 1(4): 23, t. 33. 1805., nom. illeg., non Dryander

ex Sims (1802). *Monstera cannifolia* ["cannaefolia"] Schott, Wiener Z. Kunst 127(4): 1028. 1830. *Philodendron cannifolium* (Schott) Engler, Bot. Jahrb. 26: 512. 1899, nom. illeg., nec (Dryander ex Sims) G. Don (1839) non Martius ex Kunth (1841). TYPE: t. 33 in Rudge, Pl. Guian. 1(4), 1805 (holotype).

Loosely climbing hemiepiphyte, usually climbing straight up the side of the trunk to ca. 4 m before branching and flowering. Internodes 5–20 mm long, 5–7 mm diam., weakly glossy, olive-green, drying yellow-brown to dark brown, irregularly and acutely striate, smooth. Petioles 5–10 cm long, sheathed throughout, the sheath spreading, to 1 cm wide, semiglossy except ± matte on the abaxial surface, drying finely striate on abaxial surface. Blades moderately inequilateral (one side ca. 1 cm narrower), narrowly elliptic to oblong-elliptic, broadest at the middle or slightly above the middle, 11–23 cm long, 4.3–9.7 cm wide, obtuse to rounded and abruptly acuminate at apex, acute to cuneate and abruptly ending at base, thinly coriaceous, moderately glossy above, moderately paler and matte below. Midrib narrowly sunken above, thicker than broad below, drying weakly and obtusely raised below. Primary lateral veins 8–12 pairs, arising at 55–65° angle, obtusely sunken above, weakly pleated-raised below, drying flat and obscure above, weakly raised below. Minor veins moderately distinct below, sometimes weakly undulate. Inflorescences one per axil. Peduncle 1–2.2 cm long, 3 mm diam., mostly obscured by the sheath. Spathe 8.5–10.5 cm long, barely constricted above the tube, narrowly cuspidate-acuminate at apex, pale green and semiglossy on both surfaces at anthesis, paler within, the tube 1.3–2 cm diam. Spadix 8.7–11 cm long, weakly exserted forward at anthesis, with 1–3 cm of the male spadix remaining exserted beyond the end of the spadix after anthesis. Pistillate portion 3.7–4.3 cm long, 8–9 mm diam., slightly narrower than the sterile staminate portion at anthesis, becoming broader soon after anthesis. Staminate portion moderately stubby, 5.3 cm long, ca. 1 cm diam., obtuse at apex. Sterile staminate portion barely discernible from the fertile portion. Abundant in most areas of the forest on the lower trunks of moderately large trees.

Philodendron rudgeanum ranges from Trinidad and northeastern Venezuela through the Guianas to northeastern Brazil (Amapá and Belém), then disjunctly to Bahía.

This species is distinguished from *Philodendron placidum* by having the blades matte on the lower surface and by its growth habit, which consists of a non-spiralling stem. It is most easily confused with *P. placidum*, which differs in having blades glossy on the lower surfaces and by climbing spirally up trees. In addition, *Philodendron placidum* flowers later than *P. rudgeanum*, which was only rarely in flower in mid-February when *P. placidum* was in full flower.

Philodendron surinamense (Miquel) Engler in Martius, Fl. Bras. 3(2): 133. 1878. *Elopium surinamense* (Miquel) Schott, Oesterr. Bot. Zeit. 15: 35. 1865. *Anthurium surinamense* Miquel, Natuurk. Verh. Holl. Maatsch. Haarlem, ser. 2, 7: 211. 1851. TYPE: Suriname. *Hostmann & Kappler 683a* (holotype, U; isotype, S). Figures 11, 12.

Philodendron riedelianum Schott, Oesterr. Bot. Zeit. 9: 98. 1859. TYPE: Brazil. Bahía: Ilheus, *Riedel 752* (holotype, LE 2 sheets).

Hemiepiphytic vine. Internodes terete to subtetragonous, 1.5–11 cm long, 5–7 mm diam., green, soon turning light brown. Petioles 2.5–12 cm long, sheathed throughout, the sheath erect-incurled, medium green, weakly glossy, free-rounded and narrowly rounded at apex, to 1.2 cm wide when expanded. Blades oblong-elliptic, 12–34 cm long, 3–10 cm wide, acuminate or sometimes cuspidate at apex, acute to rounded at base, subcoriaceous, semiglossy, slightly bicolorous, drying gray-green above, yellow-green below. Midrib deeply sunken above, convex below. Primary lateral veins flat and barely apparent above, flat and darker than surface below, little or not at all more apparent than the minor veins below. Inflorescence 1 per axil. Peduncle 3.5 cm long. Spathe green, 11–15 cm long, narrowly acuminate at apex, deciduous promptly after anthesis. Spadix 7–9.5 cm long. Pistillate portion 3–4.3 cm long, 8–10 mm diam.

Philodendron surinamense ranges from southern Venezuela (Bolívar and Amazonas) and the Guianas to Ecuador (Pastaza), Peru (Loreto), and Brazil (Amapá, Roraima, Amazonas, Maranhâo, and Bahía).

The species is recognized by its lack of primary lateral veins on the blade and its prompt loss of the spathe after anthesis. It is not easily confused with any other member of subgenus *Pteromischum*.

Acknowledgments. Synonymy of *Philodendron rudgeanum* was based on an unpublished manuscript by Michael H. Grayum, "A taxonomic revision of *Philodendron* subgenus *Pteromischum* (Araceae) for Pacific and Caribbean Tropical America." We thank Scott Mori and Dan Nicolson for reviewing the manuscript.

A New Name and a New Combination in East African *Erica* (Ericaceae: Ericoideae)

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ABSTRACT. A new name is proposed for *Erica excelsa* (Alm & T. C. E. Fries) Beentje, which is a later homonym of *E. excelsa* Tausch. In addition, a new combination in *Erica* based on *Philippia mafiensis* Engler is proposed.

Oliver (1987, 1988, 1989, 1991, 1992, 1993) has made a persuasive case for placing the polyphyletic *Philippia* Klotzsch in synonymy under *Erica* L. *Erica*, however, is a large genus with horticultural interest and there are many names in the literature. Not surprisingly, one of the combinations recently proposed by Beentje (1990), *E. excelsa* (Alm & T. C. E. Fries) Beentje, is a later homonym of *E. excelsa* Tausch. A new name for this species, which occurs in Kenya, Uganda, and Tanzania, is proposed here.

Erica rossii Dorr, nom. nov. Replaced name: *Erica excelsa* (Alm & T. C. E. Fries) Beentje, Utafiti 3(1): 13. 1990, non *Erica excelsa* Tausch, Flora 1834(38): 596. 1834, nec *Erica excelsa* Hort. (= ×*Erica spuria* Andrews, sec. Dulfer, 1965: 152). Based on: *Philippia excelsa* Alm & T. C. E. Fries, Kungl. Svenska Vetenskapsakad. Hand. ser. 3, 4(4): 41. 1927. TYPE: Kenya ("Kenia"). Mount Kenya, *R. E. Fries & T. C. E. Fries 1387* (holotype, UPS; isotypes, B destroyed, BR, K, S).

The epithet honors Robert Ross (b. 1912) of The Natural History Museum (London) who began his studies of tropical African Ericaceae more than 30 years ago.

The identity of *Erica excelsa* Tausch is problematic. Guthrie & Bolus (1905: 315) included it among their "Supposed Hybrids." Dulfer (1965: 140) also included it among a list of names of uncertain application, but suggested that it should be compared to *E. ventricosa* Thunberg. Resolution of its identity awaits examination of type material.

Preparation of a book, *Kenya Trees, Shrubs and Lianas* (Beentje, in prep.), led Beentje (1990) to propose new combinations in *Erica* based on the East African taxa of *Philippia*. His focus on Kenya caused him to overlook *P. mafiensis* Engler, which occurs on the islands of Mafia and Pemba in Tanzania. This species also should be transferred to *Erica*.

Erica mafiensis (Engler) Dorr, comb. nov. Basionym: *Philippia mafiensis* Engler, Bot. Jahrb. Syst. 43: 367, t. 1, A–E. 1909. TYPE: Tanzania. Mafia Island ("Insel Mafia"), *W. Busse 417* (lectotype, selected here, G; isolectotypes, B destroyed, EA—2 sheets).

The lectotype was chosen from among the syntypes.

Acknowledgments. My knowledge of African and Malagasy Ericaceae has benefited greatly from conversations and correspondence with Ted Oliver (STE). Tom Zanoni (NY) provided me with a photocopy of the protologue of *Erica excelsa* Tausch.

Literature Cited

Beentje, H. J. 1990. Name changes in East African Ericaceae. Utafiti 3(1): 13.

Dulfer, H. 1965. Revision der südafrikanischen Arten der Gattung *Erica* L. Ann. Naturhist. Mus. Wien 68: 25–177.

Guthrie, F. & H. Bolus. 1905. *Erica*. Pp. 4–315 *in* W. T. Thiselton-Dyer (editor), Flora Capensis. Vol. IV, Sect. 1. Vacciniaceæ to Gentianeæ. Lovell Reeve, London.

Oliver, E. G. H. 1987. Studies in Ericoideae (Ericaceae) VII. The placing of the genus *Philippia* into synonymy under *Erica*, the southern African species. S. African J. Bot. 53(6): 455–458.

———. 1988. Studies in Ericoideae (Ericaceae) VI. The generic relationship between *Erica* and *Philippia* in southern Africa. Bothalia 18(1): 1–10.

———. 1989. The Ericoideae and the southern African heathers. J. Linn. Soc., Bot. 101: 319–327.

———. 1991. The Ericoideae (Ericaceae)—A review. Contr. Bolus Herb. 13: 158–208.

———. 1992. Studies in the Ericoideae (Ericaceae). VIII. New combinations for *Philippia* are made in *Erica* for the Flora Zambesiaca region. Kew Bull. 47(4): 665–668.

———. 1993. Studies in Ericoideae (Ericaceae). X. Nomenclatural changes for the Flore des Mascareignes region. Kew Bull. 48(4): 767–769.

Carlowrightia sulcata (Acanthaceae), una Especie de Sudamérica Austral Tratada Previamente en *Siphonoglossa*

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RESUMEN. Una especie de Sudamérica austral tratada previamente como *Siphonoglossa sulcata* ha sido transferida a *Carlowrightia* en la recién publicada *Flora de la Provincia de Jujuy (Parte 9)* . Ya que los caracteres que justifican su posición sistemática dentro de *Carlowrightia* no se discuten en la *Flora*, se presentan aquí. *Carlowrightia* es un género que comprende 23 especies de América del Norte y América Central; ésta es la primera especie que se cita para América del Sur. *Siphonoglossa gentianifolia* Lindau, descripta para Paraguay, se reduce a la sinonimia de *Carlowrightia* sulcata por primera vez.

ABSTRACT. A species of Acanthaceae from Argentina generally treated as *Siphonoglossa sulcata* has been transferred to *Carlowrightia* in the recently published *Flora de la Provincia de Jujuy (Part 9)* . Because the characters that justify its systematic position in *Carlowrightia* are not discussed in the *Flora*, they are presented here. *Carlowrightia* is currently considered a genus comprising 23 species from North and Central America; this is the first species reported from South America. *Siphonoglossa gentianifolia* Lindau, described from Paraguay, is reduced to synonymy of *Carlowrightia sulcata* for the first time.

El tratamiento de las Acantáceas para la *Flora de la Provincia de Jujuy (República Argentina)* (Ezcurra, 1993a) y para la *Flora del Paraguay* (en prep.) ha llevado a la necesidad de definir la posición sistemática de una especie de Sudamérica austral, presente en Argentina y Paraguay, de ubicación genérica dudosa.

La especie fue originalmente descripta por Nees en 1847 como *Jacobinia sulcata*, y posteriormente tratada por Grisebach (1874) como *Dianthera sulcata*. En 1894 Lindau la ubicó en *Siphonoglossa* Oersted al publicar la combinación *S. sulcata* (Nees) Lindau. Este criterio fue el generalmente seguido en los trabajos que la trataron (Petriella, 1968; De Marco & Ruiz, 1976; Dawson, 1979; Ariza Espinar, 1984).

En 1979 Henrickson y Hilsenbeck enunciaron que las especies tradicionalmente agrupadas en *Siphonoglossa* eran un conglomerado heterogéneo. A través de varios estudios realizados durante la década del ochenta (ver lista en Hilsenbeck, 1990b), este segundo autor aclaró la identidad del género. *Siphonoglossa* en sentido estricto pertenece a la subtribu Justiciinae sensu Bremekamp (1965), y se caracteriza por el número cromosómico $n = 12$ y el polen 2-porado, dorsiventralmente aplanado, con 1–3 hileras longitudinales de ínsulas a los costados de cada poro.

Según Hilsenbeck (1990a) este tipo de polen es muy similar al de la especie argentina descripta como *Chaetothylax umbrosus* Nees (= *Justicia goudotii* Graham, 1988). Esto confirmaría la idea de Graham (1988), quien sinonimizó a *Chaetothylax* y *Siphonoglossa* bajo una misma sección de *Justicia*, señalando así la afinidad entre las especies de estos dos géneros.

En cambio la especie descripta como *Siphonoglossa sulcata* se caracteriza por el número cromosómico $n = 18$ ($2n = 36$) (Piovano & Bernardello, 1991), y el polen subesférico, tricolporado, con los colpos con un seudocolpo a cada lado (Petriella, 1968; Hilsenbeck, 1990a). Esto apoya la propuesta de Hilsenbeck (1989b) de excluir esta especie de *Siphonoglossa*. Al proponer la exclusión este autor señaló que existía afinidad entre la especie argentina y el género norteamericano *Yeatesia* Small (Hilsenbeck, 1989b), pero no la incluyó en la revisión del mismo que publicó ese mismo año (Hilsenbeck, 1989a).

Siphonoglossa sulcata se diferencia marcadamente de la especie tipo de *Yeatesia* por la morfología del polen, que en *Yeatesia viridiflora* (Nees) Small es globoso y triporado, con la superficie diminutamente espinulosa o papilosa (Hilsenbeck, 1989a), aunque las otras dos especies tratadas den-

tro de este género por este autor posean el polen similar. También se diferencia por la morfología de la cápsula, ya que en *Yeatesia* las placentas generalmente se separan a la madurez, como en *Tetramerium* Nees (Hilsenbeck, 1989a).

Considero en cambio que por las características que enuncio a continuación, *Siphonoglossa sulcata* entra dentro de la variabilidad del género *Carlowrightia* A. Gray tal como fue circumscripto por Daniel (1983, 1988): (1) hábito herbáceo, (2) corola blanca o lilacina, de 1.5–2 cm de longitud, sin rúgula, con tubo basal delgado, (3) dos estambres, y ningún estaminodio, (4) anteras bitecas con las tecas insertas a la misma altura en los filamentos, (5) polen tricolporado, subesférico a levemente prolado, con cada colpo con un seudocolpo a cada lado, la superficie diminutamente reticulada, (6) cápsulas de 1.2–1.6 cm de longitud, con las placentas que no se separan elásticamente de las paredes internas a la madurez de las cápsulas, (7) semillas comprimidas, suborbiculares, de más de 4 mm de diámetro, diminutamente tuberculadas, (8) número cromosómico $n = 18$, $2n = 36$, (9) flor aparentemente esternotriba, debido a que los dos estambres, epipétalos, están insertos en la fauce de la corola uno a cada lado lel lóbulo inferior y central. Como los filamentos son muy cortos y las anteras son dorsifijas y de dehiscencia introrsa, la descarga de polen se produce desde la parte anterior de la flor hacia el labio posterior, probablemente rozando en la región ventral del polinizador.

La posición dentro del género *Carlowrightia*, sin embargo, es problemática, ya que sus caracteres no coinciden claramente con los de ninguna de las secciones propuestas por Daniel. La especie sudamericana se asemeja a especies de la sección *Carlowrightia* en características de la inflorescencia, de la cápsula y la semilla, pero se diferencia principalmente por la corola con tubo angosto y más largo que el limbo. Esta diferencia podría ser el resultado evolutivo de la presión selectiva de polinizadores diferentes, principalmente Dípteros e Himenópteros en la especie norteamericana (Daniel, 1983), mientras que probablemente Lepidópteros en la especie sudamericana. Esto ya ha sido sugerido para explicar las diferencias en morfología de la corola entre especies melitófilas y esfingófilas de *Ruellia* L. (Acanthaceae), claramente afines en otros caracteres (Ezcurra & de Azkue, 1989). Varios géneros de Acantáceas presentan una gran diversificación en la morfología de la corola, como *Justicia* (Graham, 1988), y *Ruellia* (Ezcurra, 1993b).

El polen de esta especie se asemeja mucho al de la especie de *Anisacanthus* Nees presente en la Argentina (Petriella, 1968: 65). *Carlowrightia* es muy afín a *Anisacanthus*, como ha sido señalado por ejemplo por Hagen (1941) y por Daniel (1983, 1988). Según Daniel (1986) y Daniel y Chuang (1993), *Carlowrightia*, *Anisacanthus*, *Tetramerium*, *Streblacanthus*, y *Yeatesia*, junto con algunos otros géneros afines, pertenecen todos a la subtribu Odontoneminae (sensu Bremekamp, 1965), pero como poseen androceo de dos estambres, sin estaminodios, y número cromosómico $n = 18$, conforman un grupo taxonómico natural que tal vez merecería reconocimiento supragenérico (Daniel, 1986).

La mayoría de las especies de *Carlowrightia* habitan en América del Norte, en regiones áridas y semiáridas desde el sur de Estados Unidos y México hasta Centroamérica (Daniel, 1983). Esta especie, que habita en Sudamérica subtropical, desde el oeste de Paraguay hasta el norte y centro de la Argentina, generalmente en la región fitogeográfica del Chaco, resulta la única cita del género para América del Sur. El género afín *Anisacanthus* también posee una distribución similar, con especies en el sur y sudeste de Norteamérica (Hagen, 1941), y otras en regiones semiáridas de Sudamérica cálida, como el Chaco y la Caatinga (sensu Cabrera & Willink, 1980).

El nombre *Siphonoglossa gentianifolia* Lindau fue creado para una forma de hoja ancha descripta para Paraguay, que entra dentro del rango de variación natural de la especie, por lo que se reduce a la sinonimia.

Carlowrightia sulcata (Nees) Ezcurra in Cabrera, Fl. Prov. Jujuy (Rep. Argentina) 9: 319, fig. 131. 1993. *Jacobinia sulcata* Nees in DC. Prodr. 11: 333. 1847. *Siphonoglossa sulcata* (Nees) Lindau, Bot. Jahrb. 19 (48): 19. 1893. TIPO: Argentina. "Rio Parana," *Tweedie s.n.*, herb. Hooker (holótipo, K no visto).

Dianthera sulcata Griseb., Abh. Ges. Wiss. Goettingen 19: 224. 1874. [Pl. Lorentzianae: 176. 1874.] TIPO: Argentina. Córdoba: Im Camp suedl. von Cordoba, Sommer 1871, *Lorentz 116* (isósintipo, CORD fotografiado en De Marco y Ruiz, 1976); In campis ab urbe meridionalibus, 1872, *Lorentz s.n.* (probable isósintipo, SI); Camp v. Cordoba, *Lorentz 776* (isósintipo, B destruido fotogr. ser. F 8798).

Siphonoglossa gentianifolia Lindau, Bull. Herb. Boissier (2me. ser.) 5: 370. 1905. Syn. nov. TIPO: Paraguay. Gran Chaco: Santa Elisa, 23°20′S, ad marginem silvarum, *Rojas 2841* (herb. Hassler) (holótipo, B destruido fotogr. ser. F 8795; isótipo, G).

Material representativo (para una lista más extensa de material de Argentina, ver De Marco & Ruiz, 1976). ARGENTINA. **Córdoba:** Quebrada de Las Rosas, *Lanfranchi 1255* (SI). **Corrientes:** Dep. Empedrado, Estancia La Yela, 20 Jan. 1958, *Pedersen s.n.* **Chaco:** Colonia Benítez, *Schulz 260* (SI). **Entre Ríos:** Dep. La

Paz, ruta 12, Arroyo Barranca Colorada, *Bacigalupo 615* (SI). **Formosa:** Dep. Patiño, Ruta 95, 1 km al N de Porteño Nuevo, *Palacios 355* (SI). **Jujuy:** Dep. Capital, camino a El Cadillal, *Cabrera 29949* (SI). **Santa Fé:** Chaco Santafecino, *Lynch s.n.*, BA 3767 (SI). PARAGUAY. **Chaco:** Agua Dulce, 60°7′W, 20°14′S, *Schinini & Bordas 18098* (MO, SI). **Presidente Hayes:** Gran Chaco, Loma Clavel, *Rojas 2629* (G).

Literatura Citada

Ariza Espinar, L. 1984. Acanthaceae. *In:* A. T. Hunziker (editor), Los géneros de Fanerógamas de Argentina, claves para su identificación. Bol. Soc. Arg. Bot. 23: 13–16.

Bremekamp, C. E. B. 1965. Delimitation and subdivision of the Acanthaceae. Bull. Bot. Surv. India 7: 21–30.

Cabrera, A. L. & A. Willink. 1980. Biogeografía de América Latina. Monogr. Cient. O.E.A. 13, 2da. edición. General Secretariat of the Organization of American States, Washington, D.C.

Daniel, T. F. 1983. *Carlowrightia* (Acanthaceae). Flora Neotropica 34: 1–116.

———. 1986. Systematics of *Tetramerium* (Acanthaceae). Syst. Bot. Monogr. 12: 1–134.

———. 1988. Taxonomic, nomenclatural, and reproductive notes on *Carlowrightia*. Brittonia 40: 245–255.

——— & T. I. Chuang. 1993. Chromosome numbers of New World Acanthaceae. Syst. Bot. 18: 283–289.

Dawson, G. 1979. Acanthaceae. *In:* A. Burkart (director), Flora Ilustrada de Entre Ríos 5: 545–576. Publ. Cient. INTA, Buenos Aires.

De Marco, N. & T. Ruiz. 1976. Revisión de los géneros *Anisacanthus* Nees, *Siphonoglossa* Oerst., *Aphelandra* R. Brown y *Dicliptera* Juss. (Acanthaceae) para Argentina. Revista del Instituto Miguel Lillo, Argentina (publicación especial): 10–44.

Ezcurra, C. 1993a. Acanthaceae. Pp. 278–359 *in* A. Cabrera, Flora de la Provincia de Jujuy (República Argentina) 9. Col. Cient. INTA, Buenos Aires.

———. 1993b. Systematics of *Ruellia* (Acanthaceae) in Southern South America. Ann. Missouri Bot. Gard 80: 787–845.

——— & D. de Azkue. 1989. Validation and genetic and morphological relationships of *Ruellia macrosolen* (Acanthaceae) from southern South America. Syst. Bot. 14: 297–303.

Graham, V. A. W. 1988. Delimitation and infra-generic classification of *Justicia* (Acanthaceae). Kew Bull. 43: 155–624.

Grisebach, A. H. R. 1874. Plantae Lorentzianae. Göttingen. (Reprinted from Abh. Königl. Ges. Wiss. Göttingen 19: 49–278. 1874.)

Hagen, S. H. 1941. A revision of the North American species of the genus *Anisacanthus*. Ann. Missouri Bot. Gard. 28: 385–404, pl. 16–18.

Henrickson, J. & R. A. Hilsenbeck. 1979. New taxa and combinations in *Siphonoglossa* (Acanthaceae). Brittonia 31: 373–378.

Hilsenbeck, R. A. 1989a (July). Taxonomy of *Yeatesia* (Acanthaceae). Syst. Bot. 14: 427–438.

———. 1989b (September). Genetic affinities and typification of eleven species excluded from *Siphonoglossa* Oerst. (Acanthaceae). Phytologia 67: 227–234.

———. 1990a. Systematics of *Justicia* sect. *Pentaloba* (Acanthaceae). Pl. Syst. Evol. 169: 219–235.

———. 1990b. Pollen morphology and systematics of *Siphonoglossa* sensu lato (Acanthaceae). Amer. J. Bot. 77: 27–40.

Lindau, G. 1894. Beiträge zur argentinischen Flora. Bot. Jahrb. Syst. 19, Beibl. 48: 8–23.

Petriella, B. 1968. El polen de las Acanthaceae argentinas. Rev. Mus. La Plata (n.s.), secc. Botánica 11: 51–68.

Piovano, M. A. & L. M. Bernardello. 1991. Chromosome numbers in Argentinean Acanthaceae. Syst. Bot. 16: 89–97.

Postscriptum

Estando esta nota en prensa, tomé conocimiento del trabajo de T. Daniel y Dieter Wasshausen recientemente publicado en Nordic Journal of Botany 13(6): 653–656 (1993), en el que documentan la existencia de otra especie de *Carlowrightia* para Sudamérica, *C. ecuadoreana* Daniel & Wasshausen. *Carlowrightia ecuadoreana* y *C. sulcata* están poco relacionadas morfológicamente y tienen distribuciones geográficas disyuntas. La existencia de estas dos especies de *Carlowrightia* en América del Sur apoya la hipótesis formulada por Daniel sobre un origen Neotropical para este género (ver Daniel & Wasshausen, 1993).

New Species of *Commelina* (Commelinaceae) from the Flora of Tropical East Africa

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ABSTRACT. Four new species and one new subspecies of *Commelina* are described from the flora of Tropical East Africa (Kenya, Uganda, and Tanzania). *Commelina melanorrhiza* Faden, *C. nairobiensis* Faden, and *C. albiflora* Faden are endemic to Kenya. *Commelina aurantiiflora* Faden & Raynsford occurs in Tanzania and Zambia. *Commelina foliacea* Chiovenda subsp. *amplexicaulis* Faden ranges from Uganda and Kenya to Malawi and Zambia. Chromosome numbers are provided for all of these taxa, three for the first time.

With more than 120 species, the flora of Tropical East Africa (Kenya, Uganda, and Tanzania) is the richest in species of Commelinaceae of any country or regional flora worldwide. In my treatment of the Commelinaceae for *Upland Kenya Wild Flowers* (Faden, 1974), five species of *Commelina* could not be identified and were designated by letters. Since then, knowledge of three of them (species "A," "C," and "E") has increased sufficiently to describe them. A fourth new species, known from Tanzania and Zambia and studied in cultivation, is also described herein. Lastly, the variation in *Commelina foliacea* Chiovenda is discussed and found to be circumscribed best by recognizing two subspecies, one of them new. The districts and divisions of the *Flora of Tropical East Africa* (U1–4, K1–7, T1–8), used for the distributions within Uganda, Kenya, and Tanzania, follow Polhill (1988).

Commelina melanorrhiza Faden, sp. nov. TYPE: Kenya (K1). Samburu Dist.: Ngeng River Valley and route to Leiturr, near Ketich Forest Station, Mathews Range Forest, 1°14′N, 37°18′E, 5,500 ft. [1,675 m], dry forest with *Cordia africana* and *Croton megalocarpus* emergents and *Haplocoelum* present on rocky outcrop, forest floor and forest road edge, 20 June 1987, *A. Faden 87/3* (holotype, US sheet no. 3120251). *Commelina* sp. "C" of Faden (1974: 657) in Agnew's *Upland Kenya Wild Flowers*. Figure 1.

Herba perennis radicibus tuberosis et nonnunquam fusiformibus, atris vel fuscis, surculis annuis, plerumque prostratis, 6–28 cm longis, foliis distichis laminis petiolatis vel sessilibus, lanceolato-ellipticis ad ovata, 1.5–7 cm longis, (0.8–)1–2.5 cm latis, spathis infundibuliformibus, subsessilibus, in extremitatibus ramulorum dense aggregatis, 1–1.5 cm longis, 0.8–1.3 cm latis, subglabris ad parce hirsutas, cincinno superiore plerumque bene evoluto, ex spatha exserto, unifloro, floribus perfectis et staminatis, petalo inferiore minuto, linearo-lanceolato vel linearo-oblanceolato, capsulis trilocularibus, trivalvibus, loculis 1-spermis, seminibus subglobosis, 1.6–2 mm diametro, farinosis, crista peripherali incrassato materiae pale brunneae composita munitis.

Shortly rhizomatous perennial with annual shoots. Roots tufted, tuberous, sometimes fusiform, 3–5 mm thick, black or dark brown. Shoots tufted, prostrate (to ascending, in cultivation), 6–28 cm long, not rooting. Internodes to 8 cm long, with a line of pubescence continuous with the line of fusion of the sheath above, sometimes sparsely puberulous elsewhere. Leaves distichous, sheath 0.3–1.7 cm long, lacking auricles at the apex, puberulous along the line of fusion and sometimes sparsely so elsewhere, ciliolate or ciliate with white hairs at the apex, lamina petiolate or sessile, lanceolate-elliptic to ovate, 1.5–7 cm long, (0.8–)1–2.5 cm wide, apex acute to acuminate, base strongly oblique, both surfaces subglabrous to sparsely puberulous, the abaxial usually more pubescent, adaxial surface scabrous, abaxial not scabrous, margins scabrous.

Spathes funnelform, subsessile (peduncles to 5 mm long), densely crowded in bracteate clusters at the ends of the shoots, 1–1.5 cm long, 0.8–1.3 cm high, subglabrous to sparingly hirsute, fused for at least half their width; upper cincinnus often well developed, exserted from the spathe, 1-flowered, with a sparsely puberulous peduncle, this cyme sometimes not developed; lower cincinnus 2–5-flowered.

Flowers perfect (lower cyme) and staminate (upper cyme), ca. 1.5 cm wide. Pedicels glabrous, that of the staminate flower 5.5–8 mm long, those of the perfect flowers shorter. Sepals green with hyaline

Figure 1. *Commelina melanorrhiza* Faden. —A. Habit. —B. Leaf. —C. Spathe and perfect flower. —D. Perfect flower, front/side view. —E. Perfect flower, side view. —F. Capsule before dehiscence, front view. —G. Capsule before dehiscence, side view. —H. Capsule after dehiscence and seed shed. —I. Seed, dorsal view. —J. Seed, ventral view. —K. Seed, side view. All from *A. Faden 87/3*.

margins, glabrous, upper sepal ca. 2–2.5 mm long, lower sepals fused for about ⅔ their length, 3–4 mm long. Paired petals 7–8.5 mm long, limb ovate, 4–5 mm long, 6–7.5 mm wide, lilac, mauve, or pale purple to pale blue, apex rounded to emarginate, base cordate to broadly cuneate, claw 3–3.5 mm long, white; medial petal minute, linear-lanceolate to linear-oblanceolate, ca. 1 mm long, white. Staminodes equal or the middle sometimes lacking an antherode, filaments creamy yellow, ca. 3.5–5 mm long, antherodes cruciform, 6-lobed or variously reduced, ca. 0.7–1 mm long, bright yellow. Stamens with filaments creamy yellow, lateral stamens with filaments ± parallel in perfect flower and somewhat divergent in staminate flower, ca. 4–4.5 mm long, gently sigmoid, anthers elliptic, ca. 1 mm long, connective grayish, sutures blue-black, pollen dirty yellow; medial stamen with filament ca. 4.5 mm long, strongly arcuate-ascending and bright yellow at apex, anther saddle-shaped, ca. 2 mm long, connective yellow, sutures blue-black, pollen concolorous with lateral anther pollen. Ovary sessile, subglobose, ca. 1 mm long, glabrous, trilocular, the locules 1-ovulate; style strongly arcuate-decurved, recurved at the apex, ca. 6 mm long, creamy yellow; stigma capitate, lilac.

Capsules trivalved, trilocular, 2.5–3 mm long, 2.5–3.5 mm wide, stramineous, glabrous, locules all smooth, dehiscent, 1-seeded. Seeds subglobose but less convex to almost planar on the ventral surface, 1.6–2 mm diam., not strongly apiculate, with a peripheral, thickened ridge of soft, light brown tissue encircling the seed (interrupted by the embryotega) and smaller patches of the same material scattered on the dorsal surface, testa otherwise smooth, dark brown, farinose.

Habitat. Forest, bushland and moist thickets, 760–1,675 m.

Chromosome number. $2n = 30$ (from *A. Faden 87/3 & 87/20*).

Distribution. Endemic to central and northern Kenya (K1, 4).

Commelina melanorrhiza is very distinctive because of its thick, black or dark brown tuberous roots. It bears a strong but superficial resemblance to small plants of *C. benghalensis* because of its short, proportionally broad leaves and small, funnelform, clustered spathes. However, because of its very reduced medial petal, one-ovulate/one-seeded ovary and capsule locules, its true affinities are with *C. bracteosa* Hasskarl and *C. erecta* L. From the former it differs by its tuberous roots, annual shoots, densely clustered, subsessile spathes, and seeds with an encircling ridge of soft material. From *C. erecta* it differs by its usually prostrate shoots, smaller and proportionally broader leaves that are mostly acute (vs. acuminate), less pubescent spathes, and all the capsule locules smooth and dehiscent (vs. two smooth and dehiscent and one verrucose and indehiscent in most populations). From both it differs by its well-developed upper cyme, lack of auricles at the summit of the sheath (auricles not always obvious in *C. bracteosa*), and usually smaller shoots. The lilac, mauve, or pale purple flowers present in many populations should also serve to separate *C. melanorrhiza* from the other two species.

This species has been known to me for more than two decades, but it is only the recent collections of my wife, Audrey J. Faden, that have enabled me to complete its description.

Paratypes. KENYA. **K1. Northern Frontier Distr.:** Muret River Valley, lower reaches, on a pass through the Mathews Range from Ketich Forest Station, 1°12′N, 37°23′E, ca. 5,000 ft. [1,525 m], shady damp areas in moist thickets along elephant trail, 22 June 1987, *A. Faden 87/20* (US); near Wamba on edge of Wamba Mountain, Lekanto Lugga, ca. 1°00′N, 37°22′E, 4,000–4,500 ft. [1,220–1,370 m], shady damp area near lugga edge with *Commelina africana*, 25 June 1987, *A. Faden 87/41* (US); Marsabit, 4,400 ft. [1,340 m], forest area, roadside through forest, red loam, 16 Dec. 1932, [no collector] 1910/56 (K). **K4. Kitui Distr.:** Thika–Kitui road at Tiva River, steep slope near river, 1°18′S, 37°56′E, 1,110 m, basement complex, sandy soil, degraded *Acacia–Commiphora* open bushland, 11 Nov. 1965, *J. B. Gillett 16961* (EA, K). **Machakos Distr.:** Kibwezi, 3,000 ft. [915 m], cultivated bushland with *Adansonia* on sand over basement complex, 11 Dec. 1967, *A. D. Q. Agnew 9872* (NAI). **Meru Distr.:** Meru National Park, riparian forest on the Rojwero river near the W boundary of the park, 2,500 ft. [760 m], floor of riverine forest, permanent shade, 14 May 1972, *J. Ament & F. C. Magogo 210* (EA).

Commelina nairobiensis Faden, sp. nov. TYPE: Kenya (K4). Kiambu Dist.: Nairobi–Thika road, ca. 200 m Thika side of Nairobi City boundary, 1°12′S, 36°54′E, ca. 1,550 m, drainage ditch in center strip of dual carriageway, 20 Dec. 1970, *R. B. Faden, A. Evans & F. Msafiri 70/901* (holotype, US; isotypes, BR, EA, K, MO, UPS). *Commelina* sp. "A" of Faden (1974: 660) in Agnew's *Upland Kenya Wild Flowers*. Figure 2.

Herba perennis basibus surculorum tumidis, moniliformibus, foliis anguste lanceolatis, lanceolato-ellipticis, ellipticis vel ovato-ellipticis, 2–8.5 cm longis, 1–2.5 cm latis, margine valde undulata, spathis solitariis, 1.5–2.6 cm longis, 0.9–1.3 cm latis, hirsuto-puberulis, pedunculo 0.9–3.5(–6) cm longo, cincinno superiore bene evoluto, ex spatha exserto, unifloro, floribus perfectis et staminatis, petalis superioribus 10–15 mm longis, 9–14 mm latis, petalo inferiore ovato, 5–6 mm longo, 4–5 mm lato,

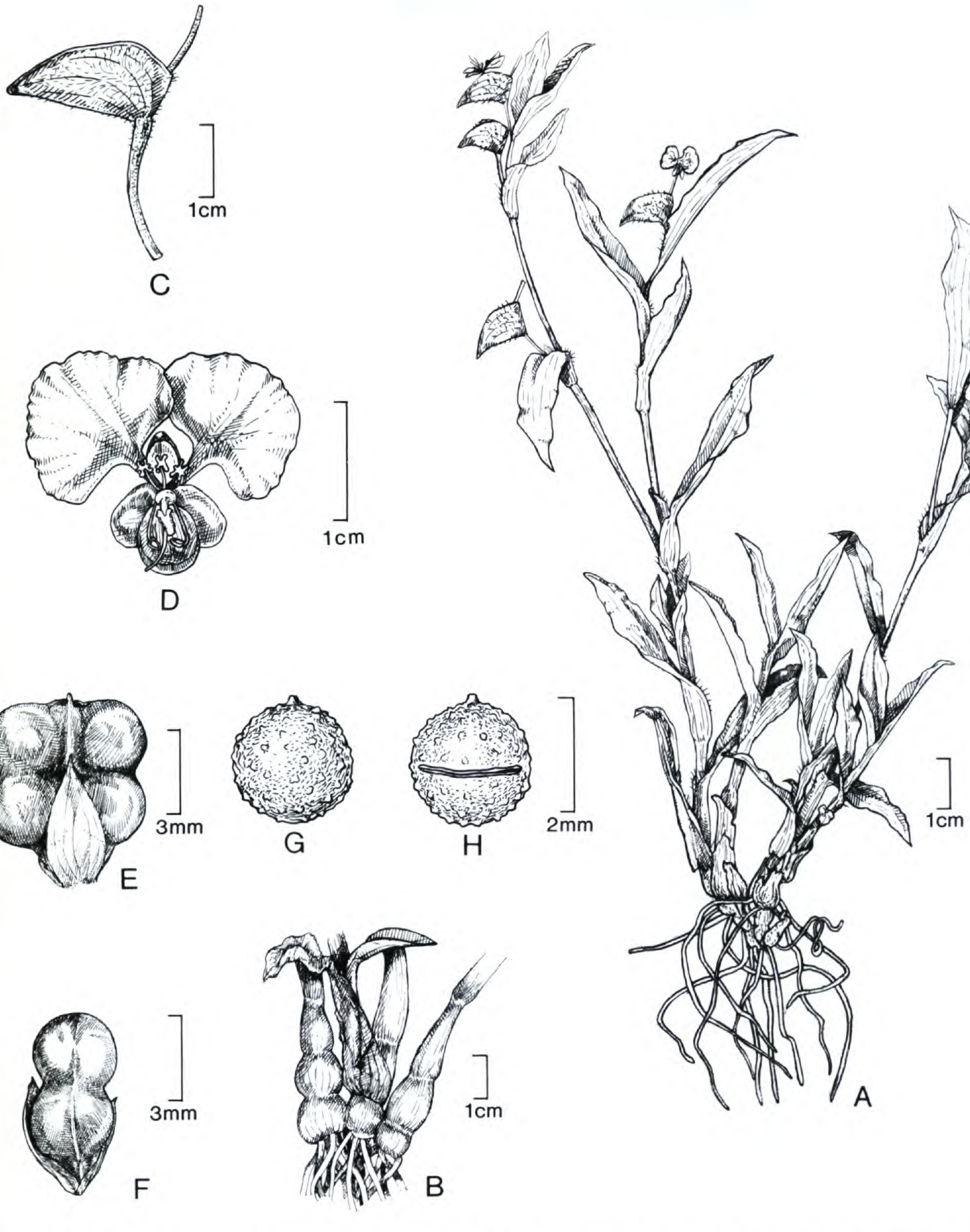

Figure 2. *Commelina nairobiensis* Faden. —A. Habit. —B. Base of plant. —C. Spathe. —D. Perfect flower, front view. —E. Capsule, dorsal view. —F. Capsule, side view. —G. Seed, dorsal view. —H. Seed, ventral view. All from *Faden & Faden 77/294* except B, which is from *Faden et al. 74/674*.

capsulis bilocularibus, loculis 2-spermis, seminibus sphaericus vel subsphaericus, ca. 2–3 mm diametro, verrucosis.

Perennial herb with swollen, moniliform, stem bases somewhat resembling orchid pseudobulbs. Roots 1–1.7 mm thick, of uniform diameter throughout their length, lacking tubers. Flowering shoots erect to ascending, 20–60 cm tall; internodes sparsely to densely hirsute, glabrescent, to 16 cm long. Leaves reduced upwards on the flowering shoots, sheaths 1–2.5 cm long, puberulous to densely hirsute, ciliate with white hairs at the apex, lamina usually not petiolate, or sometimes the lower ones shortly (rarely longly) so, narrowly lanceolate to lanceolate-elliptic, elliptic or ovate-elliptic, 2–8.5 cm long, 1–2.5 cm wide, apex acute to acuminate, base cuneate and often distinctly oblique (lower leaves) to cordate and ± amplexicaul (upper leaves), both surfaces puberulous or occasionally subglabrous, the adaxial often

hirsute as well, margins strongly undulate, scabrous apically.

Spathes solitary (not clustered), 1.5–2.6 cm long, 0.9–1.3 cm high, green, hirsute-puberulous, fused at the base for 6–8 mm, usually somewhat falcate, peduncle 0.9–3.5(–6) cm long, increasing in length post-anthesis and tending to spread at right angles to the stem; upper cincinnus well developed (rarely absent), its peduncle 1.4–1.9 cm long, long-exserted from the spathe, puberulous, producing one flower; lower cincinnus several-flowered.

Flowers perfect (lower cincinnus) and staminate (upper and lower cincinnus), 1.5–2.5 cm wide. Pedicels glabrous, 3–9 mm long, that of the upper cincinnus 7.5–9 mm long. Sepals free, glabrous, hyaline white or greenish white, tinged with blue, upper sepal lanceolate to ovate-elliptic, 5 mm long, 2–2.5 mm wide, lateral sepals lanceolate-elliptic to oblong-elliptic, 5–5.5 mm long, 3–4 mm wide. Paired petals sky blue to dark blue, rarely white, 10–15 mm long, 9–14 mm wide, limb broadly ovate to ovate-reniform, 7–9.5 mm long, apex rounded, base truncate to cordate, claw 3–4 mm long. Medial petal ovate, the same color as the paired petals, 5–6 mm long, 4–5 mm wide. Staminodes subequal, filaments 4–5.5 mm long, blue tipped with white or yellow, antherodes ± 6-lobed, yellow, 1–1.3 × 1–1.5 mm. Lateral stamens with filaments divergent, slightly sigmoid, ca. 8 mm long, blue, anthers elliptic to ovate-elliptic, 1.5–1.9 mm long, connective pale blue, anther sacs dark blue to violet, pollen dirty yellow. Medial stamen with filament 6–7 mm long, blue, anther saddle-shaped, 2.5–3 mm long, connective yellow, with brown to blue-black sutures or anther sacs, pollen yellow. Ovary green, ± discoid, style 8–9 mm long, blue, stigma capitate, violet.

Capsules bilocular, ± quadrate, 5–6 mm long and wide, locules 2-seeded. Seeds spherical or subspherical, ca. 2–3 mm diam., dark brown, verrucose, with raised pale warts and sometimes short ridges, farinose.

Habitat. Seasonally wet grassland, especially on black-cotton soil, 1,465–1,800 m; common around Nairobi.

Chromosome number. $2n = 24$ (from *Faden & Faden 77/294*).

Distribution. Endemic to central Kenya (K4, 6).

Commelina nairobiensis is a characteristic component of the black-cotton soil flora in the vicinity of Nairobi and along the Nairobi–Thika road. It is easily recognized by its erect habit, dark blue (very rarely white) flowers, swollen shoot bases, and its preference for seasonally wet soils in its very narrow range. However, it belongs to a difficult species group. Other blue-flowered, Kenyan species with quadrate capsules and more or less spherical seeds are: *C. latifolia* A. Richard, which is widespread, *C. eckloniana* Kunth, which is very local in shaded, riverine situations in the vicinity of Thika, and *C. echinosperma* K. Schumann, ("*Commelina* species B" of Faden, 1974), which is local in western Kenya. *Commelina latifolia*, which may also have somewhat swollen shoot bases when it grows on black-cotton soil, e.g., *Faden & Faden 74/733* (EA)—it also grows in many other habitats—differs in having a more sprawling or clambering habit, more distinctly and regularly amplexicaul leaves, usually no upper cincinnus, more or less smooth seeds, and a smaller, usually white medial petal. *Commelina eckloniana* is a more sprawling, decumbent plant that lacks the swollen shoot bases. *Commelina echinosperma* K. Schumann grows in better drained habitats and differs from *C. nairobiensis* most clearly by its tuberous roots and the absence of swollen shoot bases. It also has echinate seeds. The single Kenyan population studied (*Faden & Evans 69/719*, EA), had flowers with a much larger lower petal than in *C. nairobiensis*—the petals were subequal—and small, clavate, unlobed antherodes.

A single white-flowered plant of *C. nairobiensis* was found in a large population and was pressed under a separate number (*Faden 68/885A*). The chromosome number obtained for *C. nairobiensis*, $2n = 24$, is unique among East African species and is very rare in the genus as a whole.

Paratypes. KENYA. **K4. Fort Hall Dist.:** Thika, S of the Horticultural Research Station road, between road and *Eucalyptus* grove, 5,000 ft. [1,525 m], seasonally flooded grassland, 12 Dec. 1968, *Faden 68/896* (EA, K). **Kiambu Dist.:** Ngong plains, Magadi Road, mile 12 from Nairobi, grassland on black-cotton soil, 13 Jan. 1964, *Agnew & Zadock 5324* (EA, NAI) [EA sheet has "Agnew & Musumba"]; ¼ mi. toward Nairobi from Thika Road Baptist Church, W side of road, 5,500 ft. [1,675 m], 12 Dec. 1968, seasonally flooded grassland, *Faden 68/885* (EA, K, US); same data as preceding but white-flowered plant, *Faden 68/885A* (EA); 1 mi. N of Kalimoni Station on Nairobi–Thika Road, W side of road, 12 Dec. 1968, *Faden 68/889* (EA, K); Thika, between Chania High School and M. P. Shah Hostel, behind Salvation Army School, 4,800 ft. [1,465 m], seasonally flooded grassland, 25 Dec. 1968, *Faden 68/959* (EA). **Machakos Dist.:** Kilima Kiu, 5,400 ft. [1,645 m], in grass, May [1967?], *Tweedie 6787* (NAI). **Nairobi Dist.:** Nairobi, N of Kirichwa Road, 1,720 m, rainfall ca. 800 mm, shaded grassy slopes with shallow soil over lava rock, 1 May 1966, *Gillett 17301* (EA); Nairobi, 5,500 ft. [1,675 m], 1950, *Hale 46* (K); Nairobi, ca. 5 km W of the town, 1,700 m, grassy fallowland, laterite soil, 18 May 1959, *Maas Geesteranus 4674* (K); Nairobi South "b," 5,500 ft. [1,675 m], 20 Apr. 1974, *Mumiukha 298* (EA); ca. 7 mi. E of center of Nairobi, beside Embakasi Airport road, 5,500 ft. [1,675 m], on black soil

near a wet zone, 12 Dec. 1967, *Mwangangi 296* (EA, K); Eastleigh Estate, S of Eastleigh Community Centre, grassland on wet zones in black-brown soil, associated with many grass species, *Anthericum*, *Aspilia*, *Bidens pilosa*, *Galinsoga parviflora*, *Erucastrum arabicum*, etc., ca. 1,650 m, 19 May 1971, *Mwangangi & Mukenya 1586* (EA, K, US). **Nyeri Dist.:** Zawadi Estate, ca. 7 km on Nyeri–Kiganjo road, ca. 0°24′S, 36°59′E, 1,650–1,770 m, mowed, seasonally swampy grassland, 1 June 1974, *Faden, Faden & Evans 74/674* (EA, K, MO). **K6. Kajiado Dist.:** 3.5–4 km toward Nairobi from Kiserian on Magadi–Nairobi, crossing of Nol Chora stream, 1°25′S, 36°32′E, 1,800 m, roadsides and grassland on black-cotton soil with the common species being *Bothriochloa* sp., *Setaria sphacelata*, *Themeda triandra*, and *Stachys hildebrandtii*, 27 June 1971, *Faden & Evans 71/509* (EA, K, US); road to Masai Lodge from Magadi road, ca. 1°23′S, 36°47′E, ca. 1,675 m, black-cotton soil, *Faden & Faden 77/294* (F); Magadi road, SE of Ngong Hills, 1,800 m, grassland, 30 May 1967, *Strid 4178A* (NAI).

Commelina albiflora Faden, sp. nov. TYPE: Kenya (K5). Kakamega Dist.: Kakamega Forest, Kibiri Block, ca. 0°11′30″N, 34°52′E, *Celtis mildbraedii–Croton meglaocarpus* forest, being cleared, 18 Mar. 1977, *R. B. & A. J. Faden 77/900* (holotype, US; isotypes, EA, F, K). *Commelina* sp. "E" of Faden (1974: 657) in Agnew's *Upland Kenya Wild Flowers;* Faden & Suda (1980: 304).

Herba perennis decumbens foliis distichis, lamina petiolata, lanceolata ad lanceolato-ellipticam, 3.5–7 cm longa, 1.5–2.5 cm lata, pagina superior interdum vinaceo-guttata, spathis pedunculis 0.8–1 cm longis, solitariis, gibbosis, puberulis, 1.7–2.2 cm longis, 1(–1.5) cm latis, marginibus connatis supra basim, cincinno superiore absenti, cincinno inferiore 3–4 flores efferenti, floribus 1.3–1.8 cm latis, albis, capsulis trilocularis, loculis 1(–0)-spermis, seminibus ellipsoideis, 3.3–3.5 mm longis, 2.6–3 mm latis, testa brunnea laevi ad leviter scrobiculatam.

Decumbent perennial with glabrescent internodes. Leaves distichous, sheaths puberulous, 1–1.7 cm long, sparsely ciliate at apex, laminae shortly petiolate, lanceolate to lanceolate-elliptic, 3.5–7 cm long, 1.5–2.5 cm wide, apex acuminate, base usually strongly oblique, sometimes subcordate, adaxial surface dark green, lustrous, usually minutely scabrous, sometimes with 1 or more maroon spots, margins undulate, scabrid.

Spathes solitary, terminal, becoming leaf-opposed with age, 1.7–2.2 cm long, 1(–1.5) cm high, green, gibbous, filled with mucilage when young, puberulous, apex obtuse, ± mucronate, sometimes slightly falcate, base truncate to subcordate, margins fused above the base, peduncle 0.8–1 cm long, puberulous. Upper cincinnus lacking, lower cincinnus 3–4-flowered.

Flowers perfect, 1.3–1.8 cm wide; pedicels 3–3.5 mm long, glabrous. Sepals ± free, upper sepal oblong to oblong-elliptic, 3.5–4 mm long, 2.3–2.5 mm wide, greenish white, paired sepals broadly oblong-elliptic to ovate or obovate-elliptic, 4–4.7 mm long, 3–3.5 mm wide, hyaline white. Paired petals 9.5–11 mm long, 8.5–9.5 mm wide, white, limb broadly ovate to ovate-reniform, 6–7 mm long, 8.5–9.5 mm wide, apex rounded, base truncate to cordate, claw 3.5–4 mm long; medial petal cup-shaped, ovate to spathulate, 4–5 mm long, 3 mm wide, white. Staminodes subequal, filaments 5–5.5 mm long, white, antherodes cruciform, 1–1.4 mm long, connective white, lobes pale yellow. Lateral stamens with filaments gently sigmoid, divergent above the middle, 7–7.5 mm long, anthers lanceolate-elliptic, 1.3–1.5 mm long, white or cream-colored, the connective sometimes tinged greenish yellow, pollen white; medial stamen with filament white, 5–6 mm long, anther similar to the laterals but lanceolate-oblong and more saddle-shaped, 1.7–1.8 mm long, pollen white. Ovary sessile, ca. 2 mm long, dorsal locule 1-ovulate, ventral locules usually 2-ovulate (rarely 1-ovulate?), the basal ovules smaller than the apicals and apparently always aborting; style ± sigmoid, bending out of the floral midplane, white, 8.5–9 mm long, stigma usually ± capitate, white (sometimes flecked with purple).

Capsules greenish brown or the dorsal locule spotted with maroon, typically 3-seeded, with the dorsal locule ovule and apical ventral ovules maturing (frequently 1–2 of these aborting), obovoid to transversely oblong, 4–7.5 mm long, 5–6 mm wide, dorsal locule indehiscent, ventral locules typically dehiscent (tardily dehiscent or indehiscent when dorsal locule empty). Seeds ellipsoid, 3.3–3.5 mm long, 2.6–3 mm wide, testa brown, smooth to shallowly scrobiculate, minutely farinose, hilum curved.

Habitat. Moist forest in shaded situations, frequently along streams; 1,500–1,680 m in altitude.

Chromosome number. $2n = 30$ (see Faden & Suda, 1980).

Distribution. Known only from the vicinity of the Kakamega Forest in western Kenya (K3, 5).

Commelina albiflora resembles the West African species *C. cameroonensis* J. K. Morton, *C. macrosperma* J. K. Morton, and *C. longicapsa* C. B. Clarke in its white flowers and forest habitat. It differs from *C. cameroonensis* by the absence of red hairs from the sheath and by its solitary, pedunculate spathes; from *C. macrosperma* by its larger spathes and flowers and higher chromosome number (see Faden & Suda, 1980); from *C. longicapsa* by its much smaller, distichous, lanceolate to lanceolate-elliptic leaves with oblique bases, and its solitary spathes; from *C. cameroonensis* and *C.*

macrosperma by its smooth or nearly smooth seeds; and from all three by its spotted leaves (present in at least some plants in the population) and three-seeded capsules. The capsule and seed arrangement in *Commelina albiflora* are similar to those of the mainly West African *C. congesta* C. B. Clarke, but that species has sessile leaves, funnel-shaped, subsessile spathes that are frequently clustered, and usually pink-tinged flowers.

Commelina albiflora appears to be endemic to the Kakamega Forest and vicinity in western Kenya, where it is locally common but by no means abundant. This forest is well known for its West African floristic and faunistic affinities, containing many species at their easternmost occurrences (Faden, 1970). Characteristically, the Kakamega Forest also is quite low in endemism, nearly all of its species being known from Uganda and further west. Extensive fieldwork in Ugandan forests in 1969 failed to turn up this species, and Ogwal did not include it in her account of the *Commelina* species of Uganda (Ogwal, 1977). A search through the herbarium of the Jardin Botanique National de Belgique, Brussels (BR), in 1976 did not yield any additional specimens of this species.

Commelina albiflora is the only consistently pure white- flowered species of *Commelina* in Kenya, and perhaps in the entire flora of Tropical East Africa (Kenya, Uganda, and Tanzania) area, hence the specific epithet.

Paratypes. KENYA. **K3. Nandi Dist.:** Sirwa Farm, W of iron bridge on R. Yala on Kapsabet–Kisumu road, forest undergrowth, Nov. 1971, *Tweedie 4165* (K). **K5. North Kavirondo Dist.:** Kakamega Forest, Kibiri Block, S side of Yala River, 0°11′N, 34°52′E, wet evergreen forest with *Croton megalocarpus* and *Celtis mildbraedii* dominant emergents, *Bequaertiodendron oblanceolatum*, *Uvariopsis congensis*, and *Craibia brownii* common understory trees, *Dracaena fragrans*, *Acalypha* sp., *Rinorea brachypetala*, and *Brillantaisia* sp. common shrubs, 21 Jan. 1970, *Faden et al. in Faden 70/20* (EA, K); forest along the Isiukhu River S to SSW of Wibakale on Kambiri–Vihiga road, 0°21′N, 34°53′E, lowland wet evergreen forest with *Croton megalocarpus* and *Olea welwitschii* dominant upperstory trees and *Pachystela brevipes* (riparian), *Dracaena fragrans*, *Rawsonia lucida*, *Alchornea laxiflora?*, *Rinorea poggei*, *Bequaertiodendron oblanceolatum* common understory trees and shrubs, forest floor, especially on steep banks, 27 Dec. 1969, *Faden & Rathbun in Faden 69/2115* (EA); NW Kakamega Forest, 0°22′N, 34°52′E, roadside in rainforest with many creepers and undershrubs, 6 May 1971, *Mabberley 1100* (K).

Commelina aurantiiflora Faden & Raynsford, sp. nov. TYPE: Zambia. Ndola Dist.: just N of Garneton (Itimbi), S of the Kafue River, ca. 8 km NW of Kitwe, ca. 12°43′S, 28°10′E, ca. 1,250 m, edges of laterite outcrops in miombo woodland, growing in very shallow soil (1–3 cm deep) over the laterite, 4 Feb. 1973, *R. B. & A. J. Faden, W. L. Handlos & D. B. Fanshawe 74/184* (holotype, US; isotypes, EA, K, MO, SRGH) [EA and SRGH sheets pressed from cultivation 18 Aug. 1982]. Figure 3.

Herba annua plerumque ramosissima, foliis laminis sessilibus, oblongo-ellipticis, anguste ellipticis vel lanceolato-ellipticis, 2–6 cm longis, 0.3–1.4 cm latis, spathis solitariis, 1–1.8 cm longis, 0.5–0.85 cm latis, margine basi connato, pedunculo 0.7–2(–2.7) cm longo, cincinno superiore absenti, floribus perfecti, petalis superioribus aurantiis vel armeniacis, petalo inferiore minuto, albo, capsulis trilocularibus, trivalvibus, loculo dorsali 1(–0)-spermis, loculis ventralibus 2(–1)-spermis, seminibus dorsiventraliter complanatis, 1.5–2 × 1.5–1.8 mm, laevis verrucis parvulis, sparsis, albidus vel cinereis notatis.

Unbranched to densely branched annual with prostrate to erect shoots 2–20 cm long, rooting only at the base. Leaves spirally arranged on primary shoot, distichous on lateral shoots, sheaths 3–8.5 mm long, puberulous along the line of fusion, with pubescence continuing onto internode below, often sparsely to densely hirsute elsewhere, ciliate at the apex, lamina sessile, oblong-elliptic to narrowly elliptic or lanceolate-elliptic, 2–6 cm long, 0.3–1.4 cm wide, apex acute, mucronulate, base rounded to cuneate, often amplexicaul, adaxial surface glabrous or sparsely hirsute, with a deeply impressed costa, abaxial surface with a line of hairs along the costa, at least basally, rarely glabrous or with a few additional scattered hairs, margin ciliate, at least basally, rarely eciliate, scabrous at the apex.

Spathes solitary, terminal, becoming leaf-opposed, 1–1.8 mm long, 0.5–0.85 mm high, fused basally, puberulous along the line of fusion, otherwise glabrous, peduncle 0.7–2(–2.7) cm long, with a line of hairs continuous with the fused edge of the spathe, upper cincinnus lacking, lower cincinnus 1–2(–3)-flowered.

Flowers perfect, 9–10.5 mm wide. Sepals glabrous, upper ovate-elliptic, 2.5–3.5 mm long, lower sepals fused into a cup, 2.6–4.3 mm long, sometimes with petaloid appendages. Paired petals 5.8–6.5 mm long, 4.4–5.3 mm wide, limb reniform to ovate-reniform, 3–3.5 mm long, orange (RHS color #24C: *Faden et al. 74/184* in cultivation) (RHS Colour Chart, 1966) or buff-orange, claw ca. 3 mm long, purple, lower petal linear to lanceolate, 1.2–1.7 mm long, white. Staminodes 3, subequal, filaments purple, ca. 2–3 mm long, antherodes 6-lobed or somewhat reduced, white to cream, ca. 0.4–0.5 mm long × 0.7 mm wide. Lateral stamens with filaments ca. 4–5 mm long, purple, anthers ovate to broadly elliptic, ca. 0.5–0.6 mm long, blue-black or black

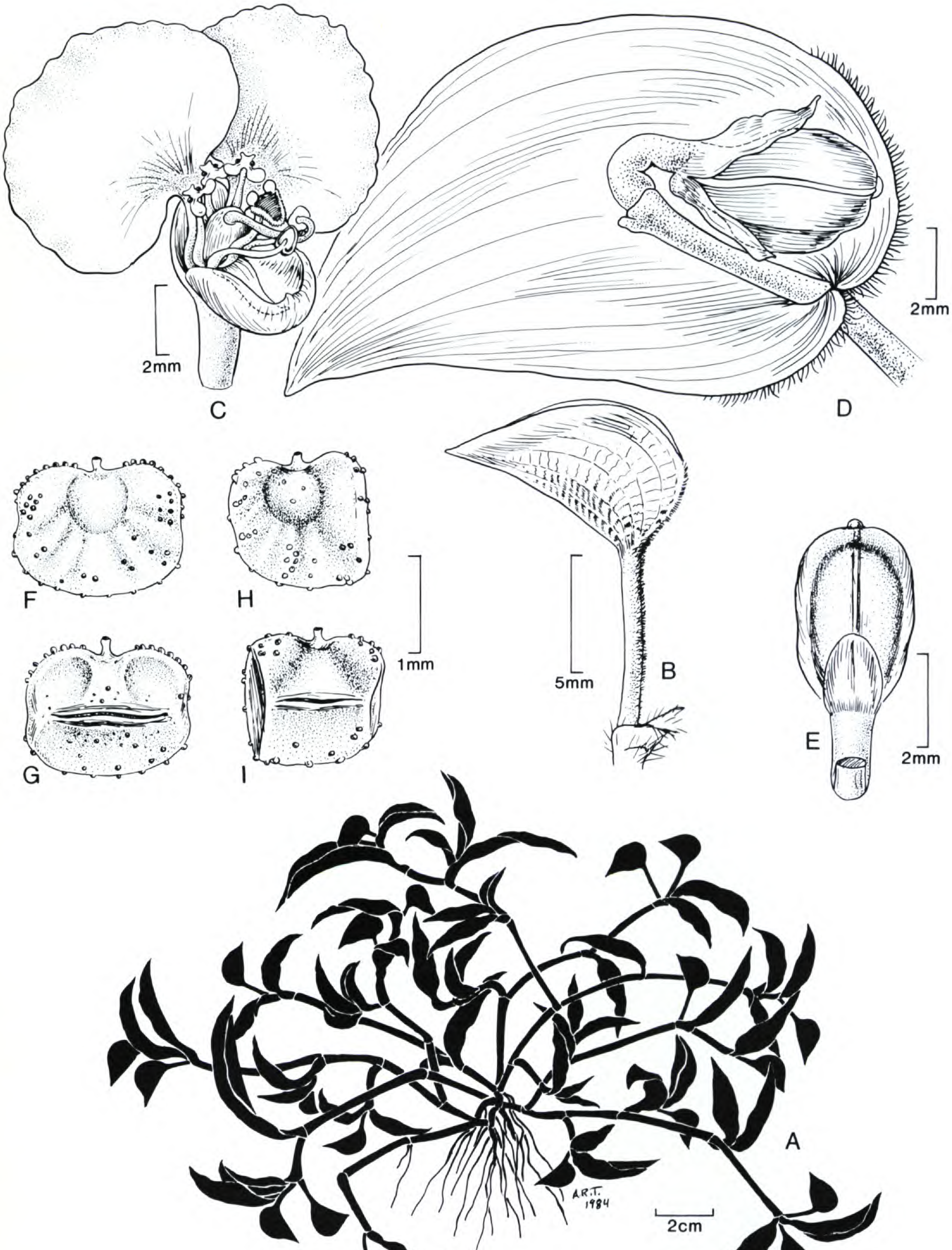

Figure 3. *Commelina aurantiiflora* Faden & Raynsford. —A. Habit. —B. Spathe. —C. Perfect flower, front/side view. —D. Spathe opened, showing capsule in side view. —E. Capsule before dehiscence, dorsal view. —F. Dorsal locule seed, dorsal view. —G. Dorsal locule seed, ventral view. —H. Ventral locule seed, dorsal view. —I. Ventral locule seed, ventral view. All from *Faden et al. 74/184*.

and yellow, pollen yellow; medial stamen with filament ca. 4 mm long, purple, anther saddle-shaped, ca. 1.2–1.3 mm long, connective purple in center, yellow-white at apex and with two yellow-white basal lobes, anther sacs blue-black, pollen yellow. Ovary trilocular, 5-ovulate, ca. 1.5 mm long, style ca. 3.5–4 mm long, purple, stigma capitate.

Capsules trilocular, trivalved, oblong-elliptic in outline, pale brown to gray-green, 4–5 mm long, 2–2.5 mm wide, dorsal locule 1(–0)-seeded, ventral locules 2(–1)-seeded. Seeds dorsiventrally compressed, mostly trapezoidal, ca. 1.5–2 × 1.5–1.8 mm, testa gray-brown with dark brown spots and streaks, smooth with very small, scattered, white to gray warts.

Habitat. Woodland and wooded grassland, sometimes growing in sand or in very shallow soil over laterite.

Chromosome number. $2n = 28$ (from *Faden et al. 74/184*).

Distribution. Southern Tanzania (T7) and northern Zambia.

Commelina aurantiiflora was described in conjunction with Anthony Raynsford, a then high school student in Washington, D.C., who undertook this as a summer study project and is therefore recognized as coauthor of this account. The maximum dimension given for the peduncle length is from a cultivated plant. In fact, a peduncle up to 4 cm long was measured, but because the specimen was not pressed, this figure has been omitted from the description.

Although the flower color in cultivated plants of the type collection definitely fell within the orange range of the RHS Colour Chart, collectors have described it in various ways: "pinky-buff" (*Fanshawe in NDO F12,194*), "yellow" (*Bjørnstad AB 1430a*), "buff-orange" (*Faden & Faden 74/121*), "buff" (*Faden et al. 74/184*), or even "white" (*Richards 872*). How much this reflects true variation, as opposed to the difficulty in describing the color, is unknown. Other species with similar flower colors have sometimes been described as apricot- or peach-colored.

Commelina aurantiiflora belongs to a well-defined group of savanna and woodland annuals that is widespread in Africa. It includes *Commelina aspera* Bentham and *C. nigritana* Bentham, both of which may occur with the new species in Zambia. The group is characterized by fused spathe margins, small apricot, orange, or buff-orange flowers, fused lower sepals, a very reduced medial petal, and the basic chromosome number $x = 14$. Both of those species differ from *C. aurantiiflora* by their falcate spathes, narrow leaves, and three one-seeded capsule locules. [Five-seeded capsules are present in *C. nigritana* var. *gambiae* (C. B. Clarke) Brenan, but that form is confined to West Africa.] *Commelina aspera* further differs in being more erect and in having clustered, subsessile spathes and smooth, spherical seeds. *Commelina nigritana* var. *nigritana* has larger seeds than *C. aurantiiflora*, with each seed having two transverse pits on the dorsal surface.

Paratypes. TANZANIA. **T7. Iringa Dist.:** Ruaha National Park, Mangangwe Ranger Post, 1,330 m, *Terminalia mollis–T. sericea–Combretum grandiflorum–C. zeyheri–Dalbergia nyassae–Julbernardia globifera* woodland, 8 Mar. 1972, *A. Bjørnstad AB 1430a* (EA). ZAMBIA. **Mpika Dist.:** Mpika–Kasama road, 36 km from junction of Great North Road and Kasama road, ca. 11°30′S, 31°20′E, 1,550 m, mopane-miombo transition wooded grassland, 24 Jan. 1974, *Faden & Faden 74/113* (EA, K, MO, US); Mpika–Kasama road, 16 km toward Mpika from crossing of Chambeshi River, ca. 11°02′S, 31°08′E, 1,450 m, much disturbed *Brachystegia–Isoberlinia* wooded grassland on tan sand, 25 Jan. 1974, *Faden & Faden 74/121* (MO, US). **Mbala Dist.:** Chilongowelo, 4,800 ft. [1,465 m], 4 Mar. 1952, *Richards 872* (K). **Ndola Dist.:** Kitwe, 5 Feb. 1974, *Fanshawe in NDO F12,194* (K) [mixture with *Commelina aspera*].

Commelina foliacea Chiovenda subsp. **amplexicaulis** Faden, subsp. nov. TYPE: Tanzania (T6). Morogoro Dist.: Mkungwe Hill, NE part of Northern Uluguru Mountains, 6°52′S, 37°55′E, ca. 350 m, cultivated area at base of hill, 5 July 1970, *R. B. Faden, A. Evans & T. Pócs 70/371* (holotype, US; isotypes, C, EA, K, MO) [US, C, and MO sheets from cultivation]. *Commelina foliacea* var. nov. of Ogwal (1977: 77; fig. 13, p. 78). *Commelina foliacea* subsp. "A" of Faden & Suda (1980: 304).

A subspecie typica foliis sessilibus basibus amplexicaulis differt.

Rhizomatous perennial with thick, yellow roots, shoots annual, leaves all sessile, amplexicaul. Spathes foliaceous, the two halves spreading at maturity, upper cincinnus producing a single male flower. Flowers blue, the paired sepals connate, the medial petal minute, white to green. Capsules trilocular, bivalved, 5-seeded, the dorsal locule strongly humpbacked. Seeds rugose-reticulate, farinose.

Habitat of subspecies amplexicaulis. Open, rocky hillsides, grassland, shady places by streams, and in cultivation.

Chromosome number. $2n = 30$ (from *Faden et al. 70/371*) (Faden & Suda, 1980).

Distribution of subspecies amplexicaulis. Uganda (U1, 3, 4), western Kenya (K2), Tanzania (T2, 5, 6), Zambia, and Malawi.

Paratypes. KENYA. **K2. West Pokot Dist.:** near Sebit on Sebit–Parua road, along Sebit River, 1°24′N, 35°22′E, ca. 1,550 m, 15 Mar. 1977, *Faden & Faden 77/807* (F, US); Sebit, 5,000 ft. [1,525 m], 31 July 1969, *Mabberley & McCall 88* (K) [mixture with *C. benghalensis*]. MALAWI. **Rumphi District:** St. Patrick's Parish, 3,000 ft. [915 m], 9 Feb. 1969, *Pawek 1705B* (K). TANZANIA. **T2. Mbulu Dist.:** Tarangire National Park, 8 mi. from Tarangire Camp, *Richards 24831* (EA, K, in part). **T5. Dodoma Dist.:** Segala-Izava, 50 km E of Chenene, ca. 5°36′S, 36°19′E, 4,200 ft. [1,280 m], *Myoya & Rajabu 26* (EA). **T6. Morogoro Dist.:** Uluguru Mountains, road from Morogoro to Morningside, ca. 6°53′S, 37°40′30″E, 1,245–1,275 m, 2 Apr. 1974, *Faden & Faden 74/384* (K, MO); Uluguru Mountains, ca. 1,050 m, 22 Jan. 1933, *Schlieben 3279B* (K); Morogoro, University, 500 m, 6 May 1974, *Wingfield 2668* (EA). UGANDA. **U1. Karamoja Dist.:** Lodoketemit catchment, 4,200–4,500 ft. [1,280–1,370 m], 12 July 1958, *Kerfoot 425* (EA, K); Pian County, Lodoketemit, 4,200 ft. [1,280 m], 20 June 1962, *Kerfoot 3830* (EA), 4,400 ft. [1,340 m], 20 May 1963, *Kerfoot 4930* (EA, K), *Kerfoot 4931* (EA, K) and *4932* (EA, K). **U3. Busoga Dist.:** Iganga, 18 Dec. 1985, *Ogwal 131* (K), 18 Dec. 1983, *Ogwal 133* (K). **U4. Mengo Dist.:** Kyadondo County, Gaba road, ca. 2 mi. from Gaba, 0°15′N, 32°38′E, Aug. 1975, *Ogwal 4* (EA). **Mubende Dist:** Singo County, Watuba, 1°01′N, 31°40′E, 1,066 m, 13 Apr. 1970, *Katende K120* (K). ZAMBIA. **Eastern Prov.:** Sasare, road to copper mine, 700 m, *Robson 871A* (K).

Commelina foliacea is one of the most easily recognizable species of *Commelina* because of its large, leaflike spathes with spreading margins. Closer study has shown that it exhibits other distinctive features, such as thick, yellow roots arranged in two rows along a rhizome; flowers that are open in the afternoon; and a capsule with the dorsal locule humpbacked toward the capsule apex. Because of these distinctive attributes and ease of recognition, *C. foliacea* is one of the best species of *Commelina* to investigate morphological and ecological variation.

Over the years I have made a special effort to look for and collect *C. foliacea* at every opportunity. As a result of this endeavor—at least 27 collections made—*C. foliacea* has gone from being considered an uncommon species of limited ecological amplitude in Kenya to one of the most widespread and most ecologically diverse species of *Commelina* in the country. The species as a whole is now known to range from just above sea level to 2,250 m in elevation and to occur from dry bushland to moist forest. In fact, there is no situation that appears too extreme for *C. foliacea* except the highest mountains and the most xerophytic or saline habitats.

In the course of this investigation the occurrence of plants with amplexicaul leaves was noted. At first they were considered curiosities, then possibly a closely related species. However, when living material was collected and brought into cultivation, the amplexicaul-leaved plants were found to exhibit all of the unusual characters of the typical form. Thus, they had to be conspecific. When the ranges of the two *C. foliacea* types were determined, they proved to be almost entirely allopatric (Fig. 4), so subspecies was deemed the appropriate rank for them. Subspecies *foliacea*—the nomenclatural type of the species (*Cufodontis 698*, FT) is from Ethiopia—ranges from southern Ethiopia to northern Tanzania. It occurs mainly east of the Rift Valley in Kenya and is disjunct in western Uganda. Subspecies *amplexicaulis* is found only west of the Rift Valley in Kenya. It is widespread in Uganda and occurs in isolated localities in central Tanzania, Malawi, and Zambia. No doubt, better collecting in Tanzania would prove it to be more widespread there.

Two specimens from Mbulu District, Tanzania (Fig. 4, solid stars), show unusual features that do not agree with either subspecies. *Greenway & Kirrika 11074* (K), from Lake Manyara, has leaves hirsute below, with an oblique base that is cuneate to rounded and neither petiolate (subsp. *foliacea*) nor amplexicaul (subsp. *amplexicaulis*). One shoot on *Richards 24831* (K), from Tarangire National Park, has similar leaves that are yet more densely pubescent on both surfaces. The second shoot on the Richards sheet is, however, typical of subspecies *amplexicaulis* in all respects. The hairy shoot on *Richards 24831* and *Greenway & Kirrika 11074* represents either an unusual local variant of *C. foliacea* or else hybrids between *C. foliacea* and a species that has pubescent, distichous leaves. Because of their leaf pubescence, which does not occur in either subspecies of *C. foliacea*, these specimens are unlikely to be hybrids between the two subspecies.

It is noteworthy that the two subspecies of *C. foliacea* have been collected moderately close to one another only at the northern end of the Cheranganí Mountains in Kenya (Fig. 4, arrow). This proximity is deceptive, however, because subspecies *foliacea* (*Meyerhoff 13*, K) was collected at about 1,070 m, at the base of the mountains, whereas subspecies *amplexicaulis* (*Faden & Faden 77/807; Mabberley & McCall 88*) was found on the northwestern shoulder of the Cheranganis, through the Marich Pass, at about 1,550 m. The vegetation

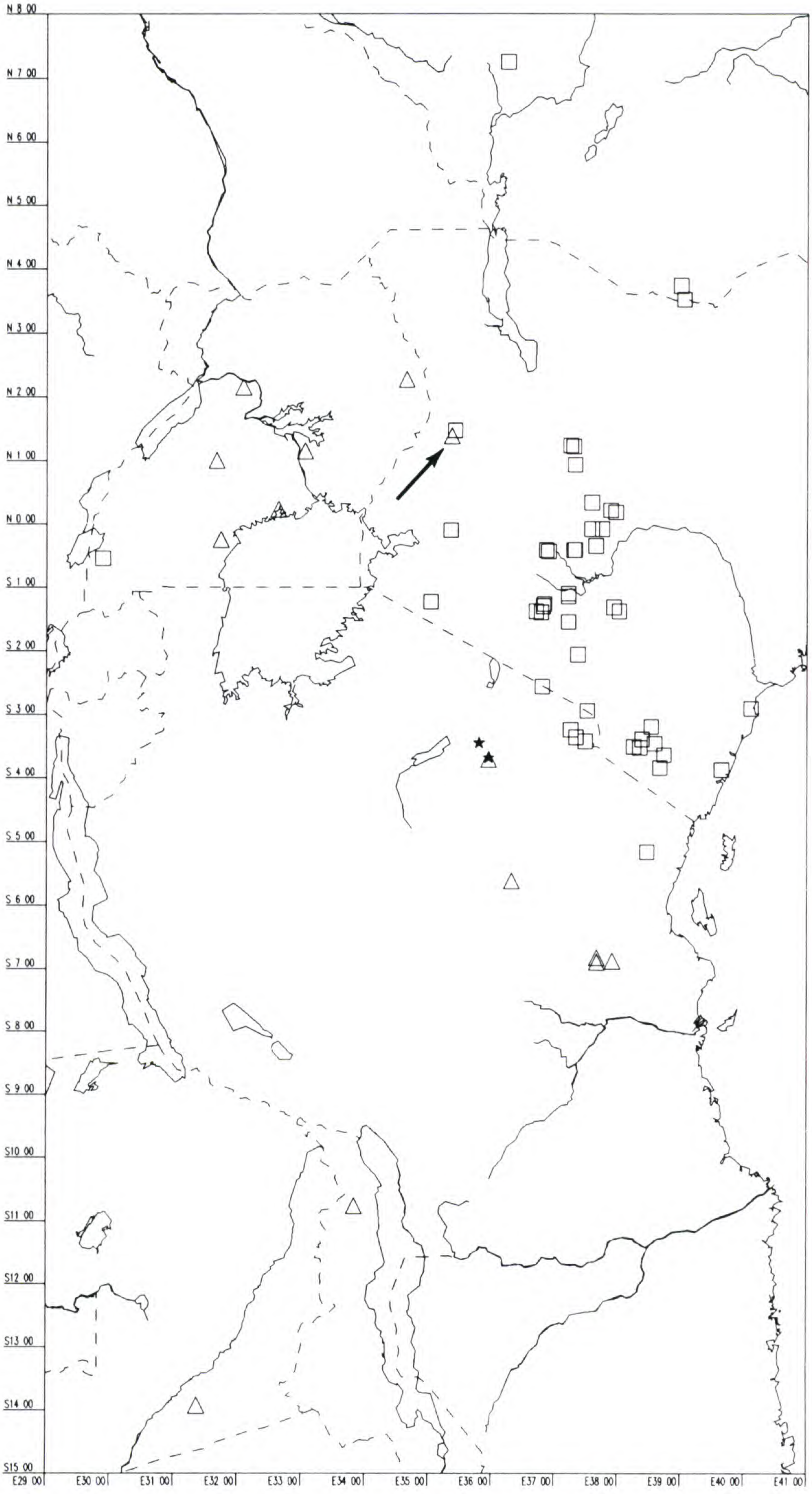

Figure 4. Distribution of *Commelina foliacea* Chiovenda. *Commelina foliacea* subsp. *foliacea* (open squares); *Commelina foliacea* subsp. *amplexicaulis* Faden (open triangles); *Commelina foliacea*, unnamed variant (solid stars).

would be quite different at these localities, although the habitat is not stated on the Meyerhoff specimen.

Ogwal (1977) referred to the amplexicaul-leaved plant as a "notorious weed of cultivation" in Uganda. Subspecies *foliacea* is not recorded from cultivation. Myoya and Rajabu (in sched.) recorded the vernacular name *Nhongo* (Kigogo) in central Tanzania for subspecies *amplexicaulis* and stated that the plant was used as a vegetable when young. Schlieben (in sched.) noted the vernacular name *Kikombata* (Kipogoro) for the same subspecies, also from Tanzania. The Pokot name *Rwanda* is given for subspecies *foliacea* in Kenya, and the boiled leaves are said to be eaten as a vegetable (in sched. *Meyerhoff 13*).

The conservation status of the just described taxa may be commented upon briefly. Among the four new species, *C. albiflora* should be considered threatened because the Kakamega Forest itself is under heavy pressure. *Commelina nairobiensis* is also restricted to a fairly small area that is densely populated. It certainly should be monitored in the future. The other two species, which grow in relatively remote areas, are, presumably, just undercollected, although I actively searched for *C. melanorrhiza* for many years without success. Perhaps it is just an uncommon species. Neither subspecies of *Commelina foliacea* is endangered or threatened throughout its range as a whole, but only in Tanzania are both subspecies known from more than a single locality. Thus in some countries one or the other subspecies would have to be considered rare.

Acknowledgments. I thank Alice Tangerini (Figs. 1, 3, and 2G, H) and Tana Acton (Fig. 2, except G, H) for the line drawings, Stanley Yankowski and Dan Cole for the map (Fig. 4), Anthony Raynsford for his studies of *Commelina aurantiiflora* and suggestion for the specific epithet, and my wife, Audrey J. Faden, for collecting *Commelina melanorrhiza* and for maintaining my research plants for many years.

Literature Cited

Faden, R. B. 1970. A preliminary report on the Kakamega Forest. East African Herbarium, Nairobi (unpublished).

———. 1974. Commelinaceae. Pp. 653–668 *in* A. D. Q. Agnew, Upland Kenya Wild Flowers. Oxford Univ. Press, London.

——— & Y. Suda. 1980. Cytotaxonomy of Commelinaceae: Chromosome numbers of some African and Asiatic species. Bot. J. Linn. Soc. 81: 301–325.

Ogwal, E. N. K. 1977. A taxonomic study of the genus *Commelina* in Uganda. M.Sc. Thesis, Makerere University, Kampala.

Polhill, D. 1988. Flora of Tropical East Africa: Index of collecting localities. Royal Botanic Gardens, Kew.

RHS Colour Chart. 1966. Royal Horticultural Society, London.

Two New Species of *Passiflora* (Passifloraceae) from French Guiana

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ABSTRACT. Two new species are described, *Passiflora kawensis* of subgenus *Astrophea* and *Passiflora exura* of subgenus *Passiflora*. Both species are common in northeastern French Guiana on Montagne de Kaw. *Passiflora kawensis* has an umbrella-shaped structure on the androgynophore shared with only three species from southern Brazil and Bolivia. *Passiflora exura* is easily distinguished from related species by the structure of the corona and the size of the awn on the sepals.

Studies toward the revision of Passifloraceae for a treatment in the *Flora of the Guianas* revealed several new species, especially from French Guiana. Recent collecting trips in that country have proved that one of the richest localities for species of passionflower is Montagne de Kaw, a low mountain range 30 km southeast of Cayenne (Feuillet, 1989). Montagne de Kaw is about 45 km long and reaches 400 m in elevation. It represents the remains of a lateritic table and their slopes between the villages of Roura and Kaw. It includes what Turenne (1979) called Montagnes de Roura, Montagne Gabrielle, and Montagnes de Kaw. On some maps the eastern tip of Montagne de Kaw is called Montagne Rebard. Localities along roads are noted as "Point Kilométrique" (PK) followed by the distance in kilometers from the beginning of the road. Those distances are marked along the roads by numbered signs placed every kilometer. Three new species of *Passiflora* L. occurring on Montagne de Kaw have already been described by Feuillet (1986) and Feuillet & Cremers (1984): *Passiflora crenata* Feuillet & Cremers and *P. rufostipulata* Feuillet, both of subgenus *Passiflora*, and *P. fanchonae* Feuillet of subgenus *Decaloba* (DC.) H. G. L. Reichenbach (= subg. *Plectostemma* Masters). Two additional species are described here: *P. kawensis* in subgenus *Astrophea* (DC.) Masters and *P. exura* in subgenus *Passiflora*.

Passiflora kawensis C. Feuillet, sp. nov. TYPE: French Guiana. Montagne de Kaw, road from Roura to Kaw, PK 39.5, 50 km SE of Cayenne, 4°33′N, 52°09′W, 400 m, 29 Mar. 1987 (fl), *C. Feuillet 4250* (holotype, US; isotypes, AAU, B, BR, CAY, COL, FI, G, HUA, K, LPB, MG, MO, MPU, NY, P, PORT, TEX, U, UPBC, VEN). Figure 1.

Species haec in subg. *Astrophea* pertinens; liana lignosa vel frutex ad 1.5–1.8 m altus cum ramis gradatim dependentes et procumbentes, juventute erectus et non capreolatus ad 0.8–1.2 m altus; flores candidi hypanthio campanulato; coronae filamenti ultra triseriati; androgynophorum altitudine oris hypanthii annulum umbraculiformem lobulatum atrovinosum ferens.

Liana climbing to more than 20 m with long thick tendrils, all parts but the flowers covered with short curved hair, the juvenile plant with a stout unbranched erect stem without tendrils up to 0.8–1.2 m high, then curving and developing tendrils, the young stems making an angle at each node; if the plant does not have a support to climb on the main stem develops several branches, the habit of the plant being then 1.2–1.8 m high, weeping and creeping on the ground. Tendrils not reaching a support fugacious except for their basal part remaining as a spinelike structure. Leaves simple; stipules minute, less than 1 mm long; petiole (10–)16–22 mm long; lamina unlobed, with two glands at the very base between the midrib and the margin, 10–15 × 4–5.5 cm, margin entire, apex sharply acute to long acuminate with a short mucro, round-asymmetric at base, shining above, tomentose on veins. Blooming on climbing, weeping, or creeping stems; cauliflory not observed. Flowers solitary or two per leaf axil; bract and bracteoles not verticillate, 0.7–1.3 mm long, serrate, pilose; peduncle 1.8 cm long, articulate near base, green, pilose; hypanthium 1.3 cm long, 0.7–1.1 cm diam. at base and top, green outside, yellowish white inside; sepals pale green outside, white inside, 3.5–4 cm long, 0.7 cm wide; petals white, 3.5 cm long, 0.5 cm wide; corona in several rows, outer two rows of filaments yellow, the outermost subdolabriform, 1 cm long, verrucose at apex, the inner capitate, 0.5 cm long, then a 4–5 mm zone with rows of little tubercules, and finally the innermost row of short filaments ca. 1 mm long; operculum laciniate, yellowish, forming a dome clos-

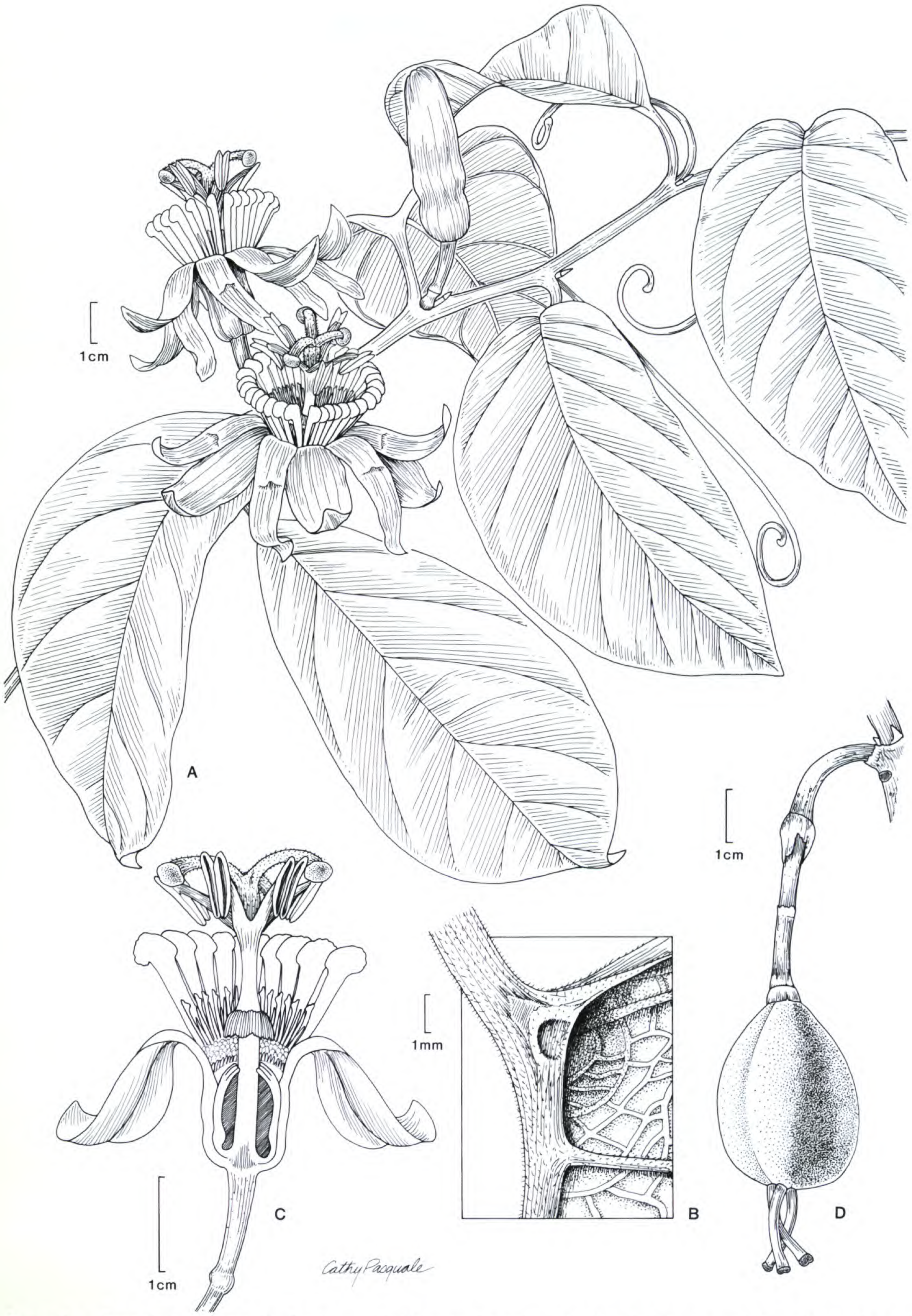

Figure 1. *Passiflora kawensis* C. Feuillet. —A. Flowering branch. —B. Gland at the base of the under surface of the leaf lamina. —C. Flower (longitudinal section). —D. Fruit. Note the scars or remains of the calyx tube, the umbrella and the stamens. A–C, *Feuillet 4250* (US); D, from photograph of *Feuillet 4176*.

ing the hypanthium cavity just over the middle; androgynophore 2 cm long, white at base, becoming green 1.3 cm from base, where bearing an umbrella-like structure, dark red, lobulate, 2 mm long, nearly closing the mouth of the hypanthium; stamens erect, filaments flat, 6 mm long, green, anthers dorsifixed about ⅓ from base, versatile, hanging upside down when mature, rounded at apex, 2-toothed at base, 7 mm long, green, pollen yellow; ovary angled, 4 mm long, green, densely rufo-tomentose; styles curved, 8 mm long, green, pilose; stigmas 3 mm diam., yellowish, glabrous. Fruit subspherical, 3 cm diam., never observed mature.

Etymology and distribution. The epithet "kawensis" refers to the collecting locality, Montagne de Kaw, where this species occurs abundantly; more than 50 plants were observed along 10 km of roadside in 1987. One sterile collection has been made 10 km north of Montagne de Kaw along the Cayenne–Régina road. So far the plant has been collected only on lateritic soils.

Phenology. Flowers and young fruits have been collected, or seen by the author, only from December to March.

Paratypes. FRENCH GUIANA. Montagne de Kaw, road from Roura to Kaw, PK 39.5, 65 km SE of Cayenne, 4°33′N, 52°09′W, 400 m, 1 Dec. 1985 (fl), *C. Feuillet 2911* (CAY), 25 Dec. 1986 (fr), *C. Feuillet 3980* (CAY), 3 Mar. 1987 (st), *C. Feuillet 4096* (CAY), 4 Mar. 1987 (st), *C. Feuillet 4144* (CAY), 5 Mar. 1987 (fr), *C. Feuillet 4176* (CAY), 8 Mar. 1987 (fl), *C. Feuillet 4184* (CAY).

This new species was referred to as *Passiflora* sp. nov. 1 in Feuillet (1989), and by Escobar (1994) as "*P.* sp. nov. *" in the key and "A new species from Montagne de Kaw . . ." in a footnote. *Passiflora kawensis* belongs to subgenus *Astrophea* sect. *Pseudoastrophea* (Harms) Killip, but the other species of this section in French Guiana, *P. candida* (Poeppig & Endlicher) Masters, *P. citrifolia* (A. L. Jussieu) Masters, and *P. costata* Masters, do not have this umbrella-shaped ring on the androgynophore. That kind of unusual structure was not mentioned by Killip (1938) or Tillett (1988), but is present in three other species (L. K. Escobar†, pers. comm.): *P. pentagona* Masters from the State of Rio de Janeiro (Brazil), *P. rhamnifolia* Masters from the States of Rio de Janeiro and Minas Gerais (Brazil), and *P. venosa* Rusby from the Department of La Paz (Bolivia). These three species are easily distinguished from *P. kawensis* by having only two rows of filaments in the corona, and by occurring only south of the 15th parallel in the Southern Hemisphere. The umbrella ring might be considered another manifestation of the trochlea, although it has a more distal position on the androgynophore. Consequently, it does not combine with the operculum to form a two-part protective barrier enclosing the nectar chamber. In contrast, it constitutes with the operculum a series of two distant barriers, the lower one (operculum) being in contact with the androgynophore and closing the tube, the upper one (umbrella) only reducing the opening of the tube, therefore limiting access to smaller pollinators.

In young plants still growing as shrubs, a stem becomes woody and branches very soon after blooming. For that reason, the peduncles of the immature fruits observed were pushed by the development of the axillary stem. This creates fissures in the early bark still bearing the now dry, broken, and brown epidermis of the fruiting stem. Figure 1D shows one fissure with the axillary stem and the fruit coming through it. The stipule-like structures are other little pieces of broken or old tissues (tendril, second peduncle, bark?), not the real stipules, which are minute and no longer present at that stage. The figure does not show the distal part of the fruiting stem.

KEY TO THE NEW SPECIES. The new species *Passiflora kawensis* should be placed in Killip's (1938: 74) key between species #330 and 331:

1a. Peduncles filiform, 3–4 cm long; outer corona filaments smooth at margin (Guyana) . *P. deficiens*
1b. Peduncles stout, not more than 2 cm long; outer corona filaments verrucose on one side toward apex.
  2a. Leaves sharply acute to long acuminate; androgynophore bearing a dark red umbrella-shaped ring (French Guiana) . . . . . *P. kawensis*
  2b. Leaves subacute, rounded or emarginate at apex; androgynophore without an umbrella-shaped ring.
    3a. Androgynophore bearing an ovoid swelling near base (from the Guianas and Amapá to Amazonian Peru) . . . . . *P. costata*
    3b. Androgynophore bearing no special structure below the stamens (lower Amazonian Brazil) . . . . . *P. faroana*

Passiflora exura C. Feuillet, sp. nov. TYPE: French Guiana. Montagne de Kaw, road from Roura to Kaw, PK 48, 70 km SE of Cayenne, 4°32′N, 52°04′W, 400 m, 5 Mar. 1988, *C. Feuillet 4675* (holotype, US; isotypes, B, CAY, DUKE, G, HUA, MO, NY, P, U). Figure 2.

Species haec in subg. *Passiflora* pertinens; folia 3-lobata; stipulae foliaceae, cochleares; bracteae involucratae, libae, integrae, foliaceae, cordatae, sessiles; flores lilacini; sepala longicornuta; operculum decurvatum; stili virides.

Liana climbing to more than 15 m with tendrils, glabrous throughout. Leaves simple; stipules folia-

Figure 2. *Passiflora exura* C. Feuillet. —A. Flowering branch. —B. Stipules. —C. Flower (longitudinal section). —D. Flower bud (bracts removed). A, from photograph of *Feuillet 4675;* B–C, *Feuillet 4721* (CAY); D, from photograph of *Feuillet 4721.*

ceous, 3 cm long, hemicordate (a half being very reduced) and acuminate, with a serrulate margin; petiole (1.5–)8–11 cm long, bearing one or two pairs of small stipitate glands near the apex; lamina cordate and shortly peltate at base, 3-lobed, median lobe (5–)8–11 cm along the vein, (2–)4–4.5 cm wide, lateral lobes (4–)7–9 × (1.5–)3–4 cm, margin entire, apex of the lobes acute and shortly mucronate, glaucous green, paler beneath. Flowers blooming acropetally on the apical part of new growth, two flowers per leaf axil, this part with leaves and internodes regularly decreasing in size and often hanging and looking like an inflorescence. Peduncle 3.5 cm long (5–6 cm in fruit), bearing three bracts 0.5 cm below the flower; bracts ovate, verticillate, sessile, entire, cordate, acute and mucronate at apex, 2.5–2.7 × 1.5–2 cm; hypanthium swollen at the base, 0.7 cm long, 1.3 cm diam. at the base and 2 cm diam. at the throat, whitish; sepals thick, green outside, lilac inside, 4 cm long, 1.2 cm wide, bearing a long subterminal awn, 2.5 cm long and 2–3 mm diam.; petal thin, white, of the same size as the sepals; corona in several rows, outside rows (3–4) of pale lilac filaments from 3 cm long (outside) and laterally flattened at base to 0.8 cm (inside) and terete, innermost row of white flat triangular processes 1 cm long; operculum decurved, bright yellow; trochlea white, bulky; androgynophore 1 cm long, obtusely 5-angled, greenish white; stamens decurved, filaments flat, 1.2 cm long, green with purple spots, anthers medio-dorsifixed, versatile, transversal when mature, all five forming a circle, rounded at apex, emarginate at base, 1 cm long, pale green, pollen yellow; gynophore terete, greenish white, 0.5 cm long; ovary obscurely trigonous, 7–8 mm long, 5–6 mm diam., yellowish white, bearing at the top three styles 1.5 cm long, spotted with purple, with stout greenish stigmas. Fruit (from *Larpin 919*, US) ovoid, 10 × 7.5 cm, green, white pruinose, soft due to a spongy mesocarp 1.5–2 cm thick; seeds elliptic, coarsely reticulate, 7 × 3 mm, nearly flat, 1.0–1.2 mm thick at margin and 1.5–1.7 mm thick in the middle, dark brown.

Etymology. The epithet "exura" (= ended in a tail) refers to the long subterminal awn of each sepal.

Distribution. The species has been collected from Montagne de Kaw, from Route de Bélizon (Montagnes Tortue), from Montagnes Cacao, and from Saül (Eau Claire). In addition, the author observed it in several instances inside the area defined by these collection localities. Although probably rather common in northeastern French Guiana, *P. exura* thrives mainly in disturbed and cut forest like roadsides or farms.

Phenology. The blooming season seems to be short: flowers have been collected only three times, in March 1987 and 1988, on the often-visited Montagne de Kaw. Fruits have been seen only twice, in May 1989 (Montagne de Kaw, O. Delanoe, photograph only) and May 1992 (Montagnes Tortue, only living seeds collected). Plants grown from the seed collection are cultivated in greenhouses by the author and by members of the "Passiflora Society International." All of them were produced vegetatively from one seedling. The only preserved fruiting specimen, *Larpin 919*, has been collected in April 1990 (Station des Nouragues) near the Arataye River.

Paratypes. FRENCH GUIANA. Montagnes Cacao, 2 km from the village of Cacao, 40 km SSW of Cayenne, 4°33′N, 52°27′W, 300 m, 29 Mar. 1986 (st), *C. Feuillet 3682* (CAY); Montagne de Kaw, road from Roura to Kaw, PK 38, 65 km SE of Cayenne, 4°33′N, 52°09′W, 400 m, 3 Dec. 1985 (st), *C. Feuillet 2920* (CAY); PK 39, 5 Mar. 1987 (fl buds), *C. Feuillet 4182* (CAY); PK 45, 400 m, 29 Mar. 1987 (st), *C. Feuillet 4502* (CAY); PK 50, 250 m, 19 Mar. 1988 (fl), *C. Feuillet 4721* (B, BR, CAY, INPA, MY, NY, P, PORT, U, US); Régina, Piste forestière de Bélizon, PK 8, 70 km S of Cayenne, 4°30′N, 52°10′W, 100 m, 19 Feb. 1988 (st), *C. Feuillet 4564* (CAY, US); PK 12, 28 Mar. 1987 (st), *C. Feuillet 4237* (CAY); Saül, route de Bélizon, Eau Claire, 3°37′N, 53°12′W, 250 m, 13 Feb. 1993 (st), *G. Cremers et al. 12991* (CAY, US); Station des Nouragues, 4°3′N, 52°42′W, Apr. 1990 (fr), *D. Larpin 919* (CAY, US).

The flower buds of *P. exura* are characteristic of this species. They are 8.5 cm long from the base of the bracts to the tip of the awns, which top the sepals by 2 cm. The peduncles are hanging and curved at a right angle just below the bracts, spreading the buds horizontally. The sepals develop much earlier than the petals, and the chamber formed by the sepals in the bud is full of liquid and, in some cases, asymmetrical. The corolla is always symmetrical during its development. The shape of the calyx might be due to the weight of liquid twisting the base of the lower sepals when the flowering branch is exposed to frequent wind. All parts of the new species blacken when drying, and herbarium specimens have leaves thinner than all related species.

For two years, numerous plants of this species have been checked for an open flower on Montagne de Kaw (about 10 plants between PK 44 and 51 on the dirt road from Roura) and along the Montagnes Tortue road (more than a hundred between PK 12 and 17) where they grow usually on the roadside, creeping on the ground, or in the secondary roadside vegetation, climbing on shrubs and on small trees. Considering its distribution, *P. exura* is

probably able to reach the canopy and survive in the forest like the other species of its group in French Guiana.

This species belongs to *Passiflora* subg. *Passiflora* (lectotype: *P. incarnata* L.) and in Killip's (1938) classification should fit the species #259–290 group: "ser. Lobatae" (nom. nud.: without type and without Latin description). It can be inserted into Killip's key near *P. rubrotincta* Killip (sp. #267) and *P. spectabilis* Killip (#268) if one considers that the leaves are "peltate at least 5 mm from lower margin," or with *P. pallens* Poeppig ex Masters (#270) and *P. elegans* Masters (#271) if one considers them as "not peltate or only slightly so." *Passiflora exura* differs from *P. elegans* and *P. pallens* in being much larger in all parts of the plant but the stipules. *Passiflora rubrotincta* has smaller leaves with glandless petioles and very short lobes (holotype studied at US). All of these other four species have a different corona structure, missing the inner rank of triangular processes. By mistake, *Passiflora spectabilis* is in this part of Killip's key, "sepals. . .with a foliaceous awn 5 mm long, or more." Its awns are clearly less than 5 mm long according to Killip (in text "0.5 to 1 mm" and in key p. 66, not in key p. 65), which was confirmed by the study of the holotype at US. *Passiflora spectabilis* should be with species #282–284 of Killip's key, *P. pennellii* Killip, *P. stipulata* Aublet, and *P. aristulata* Masters.

KEY TO THE NEW SPECIES. *Passiflora exura* can fit in Killip's key (1938: 66) as follows:

1a. Bracts petiolate, rounded at apex . . . *P. picturata*
1b. Bracts sessile, usually acute or subacute at apex.
2a. Innermost filaments obtriangular in shape, flat in section . . . . . *P. exura*
2b. Innermost filaments of various shapes, filiform, capitate or not, liguliform, bifid or reduced to tubercules but not obtriangular.
3a. Leaves peltate at least 5 mm from lower margin . . . . . *P. rubrotincta*
3b. Leaves not peltate or only slightly so . . . . . species #268–281

Acknowledgments. It is a pleasure to thank here my friend Georges Cremers, curator at CAY, who sent me *Cremers et al. 12991* and *Larpin 919* when I was completing the manuscript. I also thank Cathy Pasquale for the fine illustrations that reflect her talent and personal interest in passionflowers.

Literature Cited

Escobar, L. K. 1994. Two new species and a key to *Passiflora* subgenus *Astrophea*. Syst. Bot. 19: 203–210.

Feuillet, C. 1986. Etudes sur la Flore des Guyanes. 22: Deux Passifloraceae nouvelles et quelques espèces rares en Guyane française. Candollea 41: 173–178.

———. 1989. Diversity and distribution of Guianan Passifloraceae. Pp. 311–318 *in* L. B. Holm-Nielsen, I. C. Nielsen & H. Balslev (editor), Tropical Forests, Botanical Dynamics, Speciation and Diversity. Academic Press, London.

——— & G. Cremers. 1984. Studies on the Flora of the Guianas. 6: Passifloraceae nouvelles ou méconnues de Guyane française. Proc. Kon. Ned. Akad. Wetensch. C 87: 377–386.

Killip, E. P. 1938. The American species of Passifloraceae. Publ. Field Mus. Nat. Hist., Bot. Ser. 19: 1–613.

Tillett, S. S. 1988. Passionis Passifloris. II. Terminologia. Ernstia 48: 1–40.

Turenne, J. F. 1979. Sédimentologie. 2 unnumbered pages and pl. 6 *in* Atlas des Départements d'Outremer: IV La Guyane. CNRS-ORSTOM, Paris.

A New Species of *Atriplex* (Chenopodiaceae) from Saline Soils of Central Mexico

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ABSTRACT. *Atriplex valdesii*, a new species, is described, illustrated, and compared to its closest presumed relatives. The chromosome number is $n = 9$; photographs of the meiotic cells are presented. The species inhabits saline soils in San Luis Potosí and Zacatecas, Mexico.

Few new species of *Atriplex* (Chenopodiaceae) have been described from North America since Hall & Clements's (1923) treatment, in which many names were reduced to synonymy. Most of the recently described species of the genus are annual herbs, like those described by Weber (1950) and Stutz & Chu (1993). As a result of taxonomic study of the herbaceous species of the genus from North America (Flores Olvera, 1992, and in prep.), a new species is proposed. Due to the great reduction and similarity of the floral morphology in *Atriplex*, the taxonomic floral characters are limited to sex distribution, inflorescence, and several characters of the mature bracteoles, which enclose the fruit. Vegetative characters such as habit, duration, and especially leaves are of taxonomic utility. Form, size, margin, and veining of bracteoles and leaves are useful in the delimitation of species.

Atriplex valdesii Flores Olvera, sp. nov. TYPE: Mexico. San Luis Potosí: 1 km N de Salinas, 2,095 m.s.n.m., 23 jun. 1993, *Flores Olvera et al. 1185* (holotype, MEXU; isotypes, CAS, ENCB, GH, MO, RSA). Figure 1.

Herba monoica, annua, prostrata; caules usque ad 50 cm longi. Folia elliptica vel linearia, 4–14 mm longa, 1–3 mm lata, plerumque margine integro. Glomeruli staminati in spicis vel paniculis ad 9.5 cm longis. Bracteoli fructus maturi elliptici, circulares vel rhomboidei, 1.1–2.2 mm longi latique; margines 1–6 dentibus in tertia parte distali.

Monoecious, prostrate annual herb. Stems to 50 cm, terete, reddish, covered with dense white scurf. Leaves with Kranz structure, all alternate, with a dense permanent scurf, elliptic to linear, 4–14 mm long, 1–3 mm wide, apex acute, base attenuate, margins entire, sometimes irregularly slightly dentate; only the main vein apparent; petioles 0.5–1 mm long. Staminate glomerules in long terminal interrupted spikes or panicles to 9.5 cm long. Mature fruiting bracteoles fused overall, elliptic to circular or rhombic, 1.1–2.2 mm long and wide, margins with 1–6 teeth mostly from the basal third upwards, the central tooth frequently larger, the sides muricate, with the main vein evident, sometimes smooth, short stalked. Seeds 1–2 mm diam., dark brown; radicle superior. Chromosome number $n = 9$ (Fig. 2).

Distribution. Known from central Mexico near Salinas, San Luis Potosí, and near La Honda, Zacatecas.

Habitat. Saline plains dominated by *Distichlis spicata* (L.) Greene, *Sesuvium portulacastrum* L., and *Heliotropium curassavicum* L. and in disturbed soils.

Atriplex valdesii is related to *A. linifolia* Humboldt & Bonpland ex Willdenow, *A. muricata* Humboldt & Bonpland ex Willdenow, and *A. texana* S. Watson. Table 1 shows the affinities and differences between them. *Atriplex valdesii* closely resembles *A. linifolia:* the arrangement of the staminate glomerules is similar, but in *A. valdesii* the inflorescences are smaller; mature bracteoles and leaves overlap in form, but differ in length, width, and number of teeth of bracteoles; the leaf margin is always entire in *A. linifolia*, whereas in *A. valdesii* it is usually entire, but it can vary from entire to irregularly dentate (Fig. 1C-2 and C-5 show the common margin). The species differ in duration and habit. Both *A. linifolia* and *A. valdesii* grow on saline plains in Mexico; *A. muricata* and *A. texana* are mostly weeds, occurring from central Mexico into southern Texas, U.S.A. Like *A. valdesii*, *A. muricata* can be annual and has more or less the same leaf length, although *A. muricata* can be wider. The extreme variation in leaf margin, bracteole length and width, and number of teeth of bracteoles can overlap, but

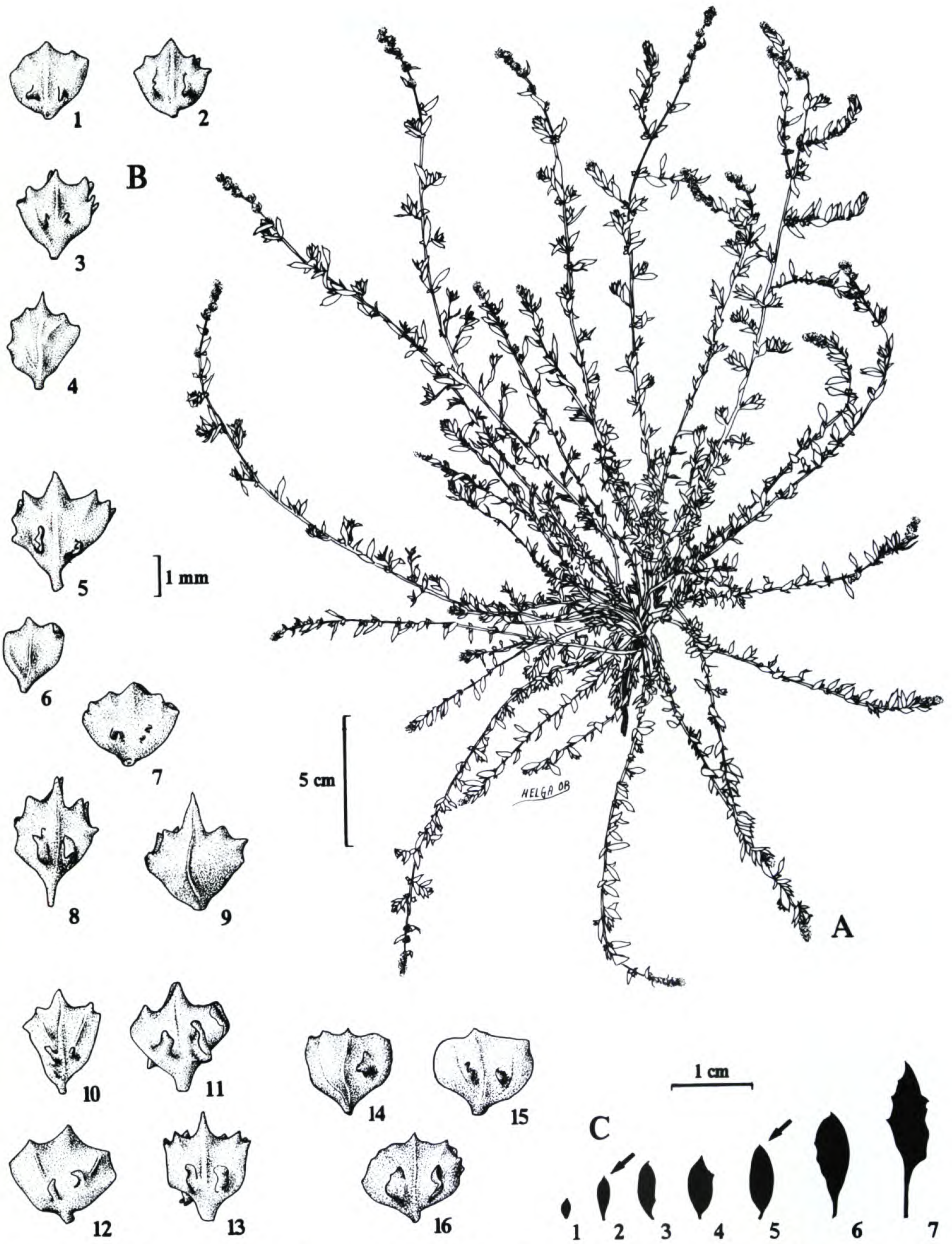

Figure 1. *Atriplex valdesii* Flores Olvera. —A. Entire plant (from *Flores Olvera 1185*). —B. Mature bracteoles variation (B1–4, from *Henrickson & Lee 17534;* B5–9, from *Flores Olvera 1185;* B10–13, from *Johnston 7466;* B14–16, from *Rzedowski 32403*). —C. Extreme leaf variation (from *Flores Olvera 1185*); the most common ones are indicated by arrows.

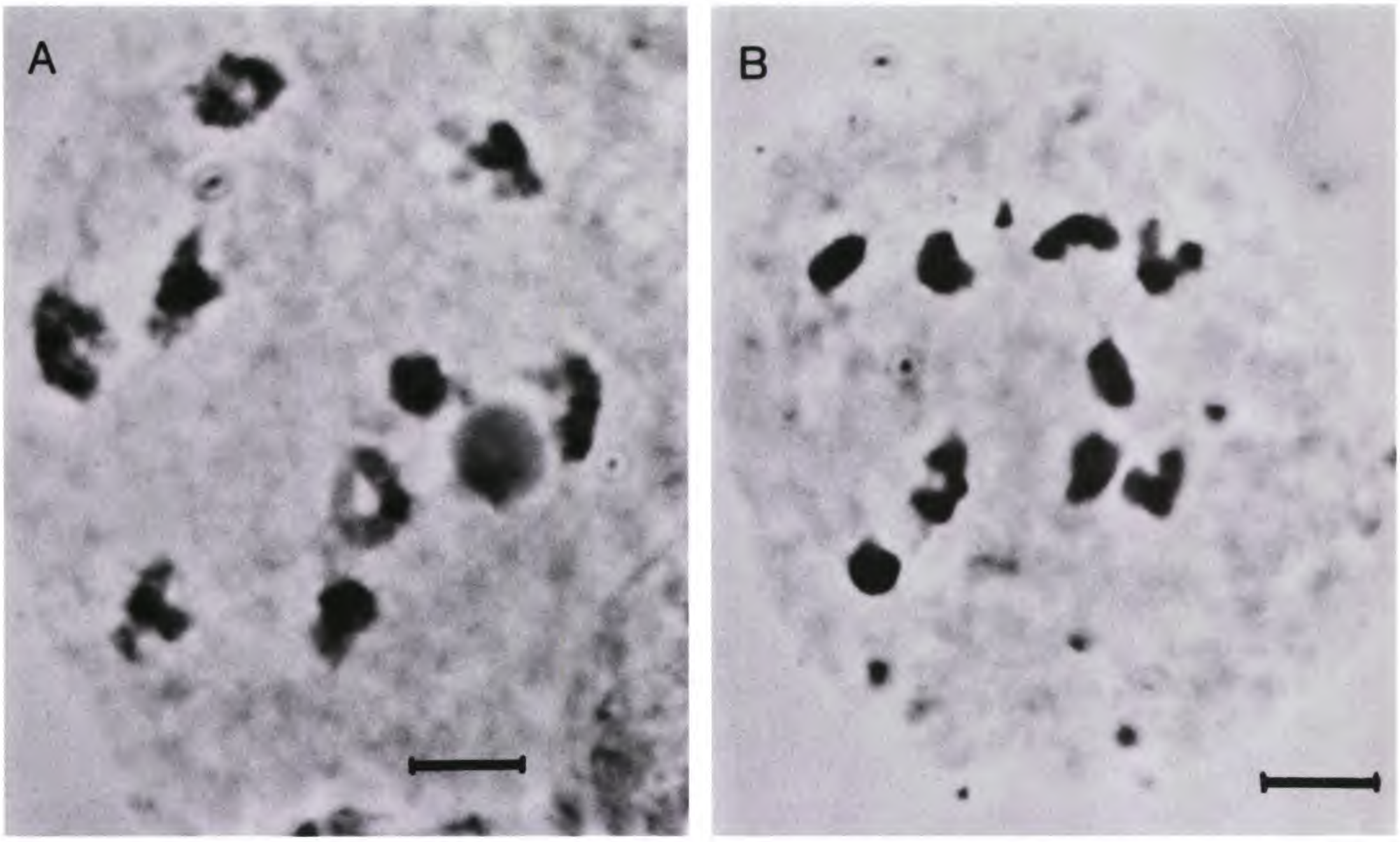

Figure 2. Meiotic chromosomes of *Atriplex valdesii* showing 9II. —A. Prophase I. —B. Metaphase I. Length of scale bar = 5 μm.

the most common states are different. The main differences between them are the bisexual glomerules in *A. muricata* (vs. unisexual in *A. valdesii*) and the undeveloped staminate inflorescence. There are some affinities between *A. texana* and *A. valdesii* in duration and leaf characters, but they differ in habit, male inflorescence length, size of bracteoles, and number of teeth. The affinity with these species places *A. valdesii* in the *A. pentandra* group (sensu Hall & Clements, 1923).

The family Chenopodiaceae has a chromosome base number of $x = 9$, but polyploidy is common

TABLE 1. Affinities and differences between the species most closely related to *Atriplex valdesii*, based on morphology.

	A. linifolia	*A. muricata*	*A. texana*	*A. valdesii*
Duration	perennial	annual-perennial	annual	annual
Habit	decumbent	decumbent	erect	procumbent
Leaf length (mm)	6–55	4–20(–33)	2–16(–24)	4–14
Leaf width (mm)	1–5	2–8(–12)	1–4(–7)	1–3(–4)
Leaf margin	entire	mostly dentate	mostly entire	mostly entire
Leaf form	linear to oblanceolate	oblanceolate to obovate	narrowly elliptic to oblanceolate	linear to elliptic
Glomerules	unisexual	mostly bisexual	both	mostly unisexual
Arrangement of staminate glomerules	spikes to panicles	—	spikes	spikes to panicles
Male inflorescence length (cm)	to 21	—	to 2.5	to 9.5
Bracteole form	oblate, elliptic or transversely elliptic	oblate	oblate to transversely elliptic	elliptic to circular or rhombic
Bracteole length (mm)	2–4	2–3(–4)	2.5–5	1.1–2.2
Bracteole width (mm)	2–4	1.5–2.5(–4)	2.5–5	1.1–2.2
Number of teeth of bracteoles	5–9	5–8	6–8	1–6

(McArthur & Sanderson, 1983). According to the information in Goldblatt (1981), most of the annual North American species of *Atriplex* have $n = 9$. In order to determine the chromosome number of *Atriplex valdesii*, field samples of young floral buds obtained from *Flores Olvera 1185* were fixed in Farmer's solution (absolute ethyl alcohol : glacial acetic acid, 3 : 1 vol/vol). Cells were stained with aceto orcein. The chromosome meiotic number is $n = 9$ (Fig. 2), like the one reported by Nobs (in Goldblatt, 1981) for some species belonging to the *A. pentandra* group.

I take pleasure in naming the species after my professor, Javier Valdés Gutiérrez, teacher of botany of many generations of biologists at UNAM, for his unconditional academic support.

Paratypes. MEXICO. **San Luis Potosí:** around NW margin of lake at Salinas near Papalote #1 and adjacent evaporative ponds, 23 Sep. 1978, *Henrickson & Lee 17534* (TEX); Salinas, a la orilla de la población, 21 Oct. 1974, *Rzedowski 32403* (ENCB, MEXU). **Zacatecas:** between La Honda and Sta. Rita, 6–8 Sep. 1938, *Johnston 7466* (GH, US).

Acknowledgments. I am grateful to Fernando Chiang for the Latin diagnosis, and to Helga Ochoterena-Booth for the illustration; to both the aforementioned and to Patricia Dávila for reviewing the manuscript. I thank Pedro Mercado for the constant help in my cytogenetic studies and Carlos Hinostrosa for assistance in the technique. I also thank the curators at ENCB, GH, MEXU, TEX, and US for the loan of material.

Literature Cited

Flores Olvera, H. 1992. Taxonomía del grupo *Atriplex pentandra* (Chenopodiaceae). Anales Inst. Biol. Univ. Nac. Autón. México, Ser. Bot. 63(2): 155–194.

Goldblatt, P. Editor. 1981. Index to Plant Chromosome Numbers, 1975–1978. Monogr. Syst. Bot. Missouri Bot. Gard. 5.

Hall, H. M. & F. C. Clements. 1923. The phylogenetic method in taxonomy. The genus *Atriplex*. Publ. Carnegie Inst. Wash. 326: 235–246.

McArthur, E. D. & S. C. Sanderson. 1983. Distribution, systematics, and evolution of Chenopodiaceae: An overview. Pp. 14–24 *in* A. R. Tiedemann, E. D. McArthur, H. C. Stutz, R. Stevens & K. L. Johnson (editors), Proceedings, Symposium on the Biology of *Atriplex* and related Chenopods. U.S.D.A. Forest Serv., Intermountain Forest and Range Exp. Sta., General Technical Report INT-172, Ogden, Utah.

Stutz, H. C. & G. Chu. 1993. *Atriplex minuticarpa* (Chenopodiaceae), a new species from eastern Utah. Madroño 40 (3): 161–165.

Weber, W. 1950. A new species and subgenus of *Atriplex* from southwestern Colorado. Madroño 10(6): 187–191.

Una Nueva *Froesia* (Quiinaceae) de la Amazonía Occidental

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RESUMEN. Se describe *Froesia diffusa* Gereau & Rod. Vásquez (Quiinaceae) del Perú (Loreto) y Brasil (Acre), distinguida por el gran número de folíolos de las hojas y la panícula alargada y difusa. Con esta especie nueva los cuatro géneros de la familia están todos representados en la flora peruana; se presentan claves de identificación de los géneros y de las cuatro especies de *Froesia* Pires.

ABSTRACT. *Froesia diffusa* Gereau & Rod. Vásquez (Quiinaceae) is described from Peru (Loreto) and Brazil (Acre), distinguished by leaves with a large number of leaflets and its elongated, diffuse panicle. With this new species all four genera of the family are represented in the Peruvian flora; keys are presented for the identification of the genera and of the four species of *Froesia* Pires.

Macbride (1956) reconoció la presencia de tres géneros de Quiinaceae en la flora peruana: *Lacunaria* Ducke, *Quiina* Aublet, y *Touroulia* Aublet. Con el descubrimiento de una especie inédita de *Froesia* Pires, todos los géneros de esta pequeña familia neotropical están representados en el Perú y pueden ser distinguidos según los criterios de la clave siguiente (Pires, 1948; Macbride, 1956; Steyermark & Bunting, 1975):

CLAVE DE LOS GENEROS DE QUIINACEAE

1a. Hojas adultas imparipinnadas.
  2a. Estípulas interpeciolares 4; sépalos libres entre sí; gineceo apocárpico, con 3 carpelos; semillas glabras ..... *Froesia*
  2b. Estípula interpeciolar única; sépalos connados al menos en la base; gineceo sincárpico, 7–8-locular; semillas pubescentes ..... *Touroulia*
1b. Hojas adultas simples (a veces las juveniles pinnadas).
  3a. Hojas siempre verticiladas (al menos en el Perú); ovario 6–12-locular con 6–12 estilos ..... *Lacunaria*
  3b. Hojas usualmente opuestas, rara vez verticiladas; ovario 2–3-locular con 2 ó 3 estilos ..... *Quiina*

Froesia Pires, Bol. Técn. Inst. Agron. N. 15: 22. 1948.

Según las descripciones de las especies de *Froesia* publicadas por Steyermark & Bunting (1975), la nueva especie puede ser distinguida como sigue:

CLAVE DE LAS ESPECIES DE *FROESIA*

1a. Folíolos 11–15.
  2a. Raquis foliar diminutamente puberulento a glabro; folíolos glabros o glabrescentes entre los nervios en el envés; folíolo apical con 21–36 pares de nervios secundarios; filamentos 3.0–5.5 mm de largo.
    3a. Pecíolo 18–29 cm de largo; folíolos uniformemente repando-crenados en el margen; folíolos basales con 12–20 pares de nervios secundarios; folíolos medios (15–)16.8–26.5 cm de largo; folíolo apical 19–24 cm de largo; pétalos 7–10 mm de largo por 3.5–5.0 mm de ancho; anteras 0.3–0.5 mm de largo; carpelos pilosulosos en la antesis [Brasil (Amazonas), Colombia (Vaupés), Venezuela (Amazonas)] ..... *F. tricarpa* Pires
    3b. Pecíolo 33–54 cm de largo; folíolos apicalmente crenados en el margen, basalmente repandos a subenteros; folíolos basales con 21–27 pares de nervios secundarios; folíolos medios 27.5–31.5 cm de largo; folíolo apical 24–29 cm de largo; pétalos 11–13 mm de largo por 6.5–10.0 mm de ancho; anteras 0.8–1.0 mm de largo; carpelos glabros en la antesis [Venezuela (Yaracuy)] ..... *F. venezuelensis* Steyermark & G. S. Bunting
  2b. Raquis foliar tomentoso o tomentuloso; folíolos pilosulosos a puberulentos entre los nervios en el envés; folíolo apical con 35–59 pares de nervios secundarios; filamentos

ca. 7 mm de largo [Brasil (Amazonas), Colombia (Amazonas)] . . . . . .
. . . . . *F. crassiflora* Pires & Fróes

1b. Folíolos 17–25.
4a. Estípulas apicales enteras, subuladas; folíolos basales 10.5–17 cm de largo; folíolo apical 15–23 cm de largo; panícula difusa 80–120 cm de largo, los catáfilos basales enteros, decíduos, 4.0–5.5 cm de largo; pedicelo 3.0–5.2 mm de largo; sépalos 2.0–4.0 mm de largo por 3.0–7.5 mm de ancho; pétalos 6.0–6.5 mm de largo por 3.0–3.5 mm de ancho; anteras 0.4–0.5 mm de largo; carpelos diminuta y dispersamente pubescentes en la antesis . . . . . .
. . . . . *F. diffusa* Gereau & Rod. Vásquez
4b. Estípulas apicales 5-laciniadas, los segmentos subulado-aristados; folíolos basales 18–25 cm de largo; folíolo apical 24–29 cm de largo; panícula compacta hasta 42 cm de largo, los catáfilos basales trífidos, persistentes, 2.5–3.0 cm de largo; pedicelo 6–8 mm de largo; sépalos 5.5–8.0 mm de largo por 6.0–10.0 mm de ancho; pétalos 11–13 mm de largo por 6.5–10.0 mm de ancho; anteras 0.8–1.0 mm de largo; carpelos glabros en la antesis . . . . . .
. . . . . 3. *F. venezuelensis*

Froesia diffusa Gereau & Rod. Vásquez, sp. nov. TIPO: Perú. Loreto: Prov. Requena, Dist. Saputena, Centro de Investigaciones Jenaro Herrera, bosque primario, 130 m, 4°55′S, 73°45′W, 12 mar. 1989 (fl), *R. Vásquez & T. Soto 11874* (holótipo, MO 4331944; isótipos, AMAZ, G, MO, NY, USM). Figura 1.

Arbores monocaules crassae. Folia stipulis subulatis; foliolis (19–)21–23(–25), lateralibus oblongis, basalibus 10.5–17 cm longis, terminali ex elliptico obovato-elliptico, 15–23 cm longo. Panicula diffusa 80–120 cm longa; cataphyllis basalibus integris, deciduis, 4.0–5.5 cm longis; pedicello sub anthesi 3.0–5.2 mm longo, sub fructu 5–7 mm longo. Flos sepalis extus tomentosis, intus glabris, margine ciliatis, 2.0–4.0 mm longis, 3.0–7.5 mm latis, externis ovatis, internis obovato-depresso-concavis; petalis obovato-oblongis, 6.0–6.5 mm longis, basi 1.8–2.0 mm latis, apicem versus 3.0–3.5 mm latis; staminibus 245–250, filamentis 3.0–4.5 mm longis, antheris 0.4–0.5 mm longis; carpellis ovoideo-dimidiatis, 1.3–1.8 mm longis, extus minute disperseque pubescentibus. Fructus ex 1–3 mericarpiis ellipsoideis 17–24 mm longis, 14–19 mm latis constans, juventute apiculatis, maturitate obtusis, valvis sub dehiscentia reflexis; seminibus ellipsoideis, 14–19 × 10–14 mm, nigris, nitidis.

Arboles 6–20 m de alto, monocaules (ocasionalmente con una rama cuando el eje central ha sido dañado), conspícuamente lenticelados, crasos y generalmente fistulosos hacia el ápice. Hojas con estípulas enteras, subuladas, 5–15 mm de largo; pecíolo 33–51 cm de largo, lenticelado en la base, el raquis 46–82 cm de largo, ambos abaxialmente tricostados y frecuentemente diminutamente lenticelado-maculados; peciólulos 0.9–4.5 cm de largo; folíolos (19–)21–23(–25), opuestos, subopuestos o alternos, el ápice acuminado y agudo, la base obtusa a redondeada, inequilátera, el margen entero a repando y crenado-aserrado hacia el ápice, los nervios secundarios distantes entre sí por 3–14 mm, la haz glabra o dispersamente estrigulosa, el envés estriguloso y rojizo-punteado sólo en los nervios; folíolos laterales oblongos, los basales 10.5–17 × 4.7–7.5 cm con 15–20 pares de nervios secundarios, los del quinto par 22.5–50 × 6–12 cm con 22–52 pares de nervios secundarios; folíolo terminal elíptico a obovado-elíptico, 15–23 × 7.0–9.5 cm con 21–30 pares de nervios secundarios. Panícula difusa, cónica, 80–120 cm de largo, con catáfilos basales enteros, decíduos, 4.0–5.5 cm de largo; raquis lenticelado, pubescente con tricomas de color marrón a glabrescente, usualmente fistuloso, con 5–9 verticilos o subverticilos de (2–)3–4 ramas primarias, éstas cada una con 1–3 verticilos o subverticilos de ramas secundarias; ramas primarias basales con largo igual al ¼–⅓ del largo total de la panícula; ramas secundarias densamente tomentosas con tricomas de color marrón; brácteas (en la base de las ramas primarias) estrechamente ovado-triangulares, 14–30 mm de largo, longitudinalmente estriado-nervadas, usualmente decíduas después de la antesis, raramente persistentes en la fructificación; bractéolas (en la base de los pedicelos) 2, ovado-elípticas, 1.2–1.7 × ca. 0.6 mm, densamente tomentosas con tricomas de color marrón al exterior y glabradas al interior; pedicelo articulado en la base en la inserción de las bractéolas, turbinado-cilíndrico, terete en la base, ligeramente anguloso hacia el ápice, 3.0–5.2 mm de largo, ca. 0.8 mm de diám. en la base, ca. 2.5 mm en el ápice, acrescente hasta 5–7 × 3–5 mm en la fructificación. Botón floral ovado-depreso, 4–5 mm de diám.; flor con sépalos densamente tomentosos con tricomas de color marrón en la cara externa, glabros en la cara interna, ciliados en el margen, los 2 externos ovados, el primero ca. 2.0 × 3.0 mm, el segundo ca. 2.4 × 3.0 mm, los 3 internos obovado-depreso-cóncavos, asimétricos, el tercero ca. 3.0 × 4.0 mm, el cuarto ca. 4.0 × 5.5–7 mm, el quinto ca. 4.0 × 6.5–7.5 mm; pétalos obovado-oblongos, 6.0–6.5 mm de largo, 1.8–2.0 mm de ancho en la base y 3.0–3.5 mm hacia el ápice, el ápice bilobulado con hendidura central 0.6–0.8 mm de profundidad, el margen apical premorso a diminutamente dentado; estambres 245–250, libres, los filamentos 3.0–4.5 mm de largo con los externos ligeramente más largos que los internos, las anteras dorsi-basifijas, 0.4–0.5 mm de largo; carpelos ovoide-dimidiados, 1.3–1.8 mm de largo, connados ventralmente en la base por ca. 0.4 mm,

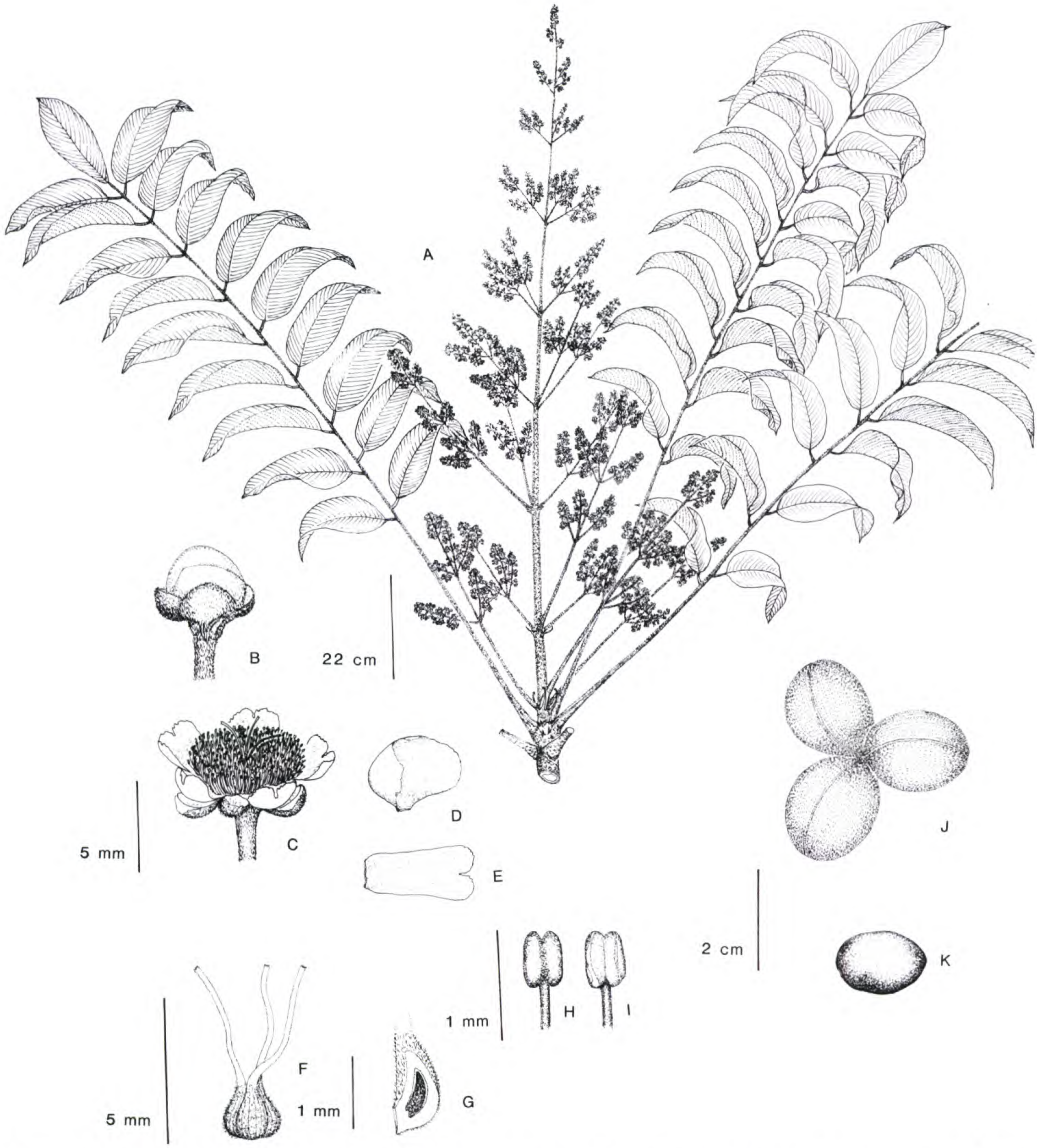

Figura 1. *Froesia diffusa* Gereau & Rod. Vásquez. —A. Apice de la planta con hojas e inflorescencia. —B. Botón floral. —C. Flor abierta. —D. Cuarto sépalo. —E. Pétalo. —F. Gineceo. —G. Carpelo en corte longitudinal. —H, I. Antera. —J. Fruto. —K. Semilla. Dibujos basados en: A–I, *Vásquez & Soto 11874*; J, K, *Vásquez et al. 6555*.

la superficie diminutamente estriada longitudinalmente y diminuta y dispersamente pubescente; estilos glabros, 4.4–4.6 mm de largo; estigmas cilíndricos, diminutamente denticulados en el margen. Fruto de 1–3 mericarpios elipsoides, rojo-anaranjados cuando maduros, 17–24 × 14–19 mm, glabros o diminuta y dispersamente puberulentos, diminutamente estriados longitudinalmente, con 2 costas adaxiales inconspícuas, apiculados cuando inmaduros, obtusos a la madurez, el pericarpio 0.9–2.5 mm de espesor, usualmente más grueso hacia la base del mericarpio, las valvas reflexas en la dehiscencia; semillas elipsoides, 14–19 × 10–14 mm, negras, nítidas.

Además de las diferencias mencionadas en la clave, las cuatro especies de *Froesia* ocurren en hábitats distintos. *Froesia venezuelensis* se encuentra en bosques nublados de la Cordillera de la Costa de Venezuela (Steyermark & Bunting, 1975), mientras

que *F. crassiflora* y *F. tricarpa* crecen en altitudes bajas en las cuencas de los Ríos Negro y Amazonas, frecuentemente en suelos con arena blanca. En contraste, *F. diffusa* crece en bosques primarios con suelos arcillosos de la Amazonía occidental.

Parátipos. PERU. **Loreto:** Prov. Maynas, Puerto Almendras, 122 m, 3°48′S, 73°25′W, 30 jul. 1982 (fr), *R. Vásquez & N. Jaramillo 3198* (AMAZ, MO, NY, USM), 23 sep. 1985 (fr), *Vásquez & Jaramillo 6791* (AMAZ, MO, NY, USM); Allpahuayo, Estación IIAP, 150 m, 4°10′S, 73°30′W, 6 jun. 1985 (fr), *Vásquez et al. 6555* (AMAZ, F, G, MO, NY, USM); Sgto. Fernando Lores T., Miraflores, Quebrada Tamshiyacu, 200 m, 4°15′S, 72°40′W, 24 feb. 1986 (fr), *Vásquez & Jaramillo 7252* (AMAZ, MO, NY, USM); Santa María de Nanay, Mishana, 150 m, 3°51′S, 72°32′W, 24 abr. 1986 (fr), *Vásquez et al. 7538* (AMAZ, MO, NY, USM); Prov. Requena, Sapuena, Jenaro Herrera, 180 m, 4°55′S, 73°45′W, 29 jun. 1986 (fr), *Vásquez et al. 7731* (AMAZ, MO), 16 sep. 1987 (fr), *Vásquez & Jaramillo 9629* (AMAZ, MO). BRASIL. **Acre:** Serra da Moa, Rio Moa, 6 km above school, 25 avril 1971 (fr), *Prance et al. 12455* (MO, NY).

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Literatura Citada

Macbride, J. F. 1956. Quiinaceae. *In:* J. F. Macbride, Flora of Peru, Field Mus. Nat. Hist., Bot. Ser. 13(3A): 717–726.

Pires, J. Murça. 1948. Quiinaceae. Bol. Técn. Inst. Agron. N. 15: 22–31.

Steyermark, J. A. & G. S. Bunting. 1975. Revision of the genus *Froesia* (Quiinaceae). Brittonia 27: 172–178.

Typification of Six Robert Brown Brassicaceae Names from Arctic North America

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ABSTRACT. Typifications are made for six taxa in the Brassicaceae described by Robert Brown from plants collected in arctic North America. The taxa were published in his 1823 preprint *Chloris Melvilliana*, which in 1824 appeared as the botanical appendix to William E. Parry's *Supplement to the Appendix of Parry's First Voyage*. Lectotypes are selected for *Eutrema edwardsii* R. Brown, *Parrya arctica* R. Brown, *Parrya macrocarpa* R. Brown, *Platypetalum* R. Brown, and *Platypetalum purpurascens* R. Brown, and a neotype is selected for *Platypetalum dubium* R. Brown.

Between 1819 and 1820, William E. Parry (1790–1855), commander of H.M.S. *Hecla*, made his first journey to arctic North America in search of a navigable northwest passage from the Atlantic to the Pacific. During the summer of 1820, Parry and several members of the expedition made botanical collections on Melville Island, in the present-day Franklin District of the Northwest Territories, Canada, at 75°15′N, 110°00′W. Upon return from the voyage, Parry gave the specimens to Robert Brown (1773–1858) in London for identification. Parry asked for Brown to prepare their determinations in time for their inclusion as a botanical appendix to his official report of the journey. However, Brown was unable to give Parry a manuscript until late 1823, causing a delay in the publication of all the natural history studies. Parry's report was published in 1821 without the appendices as [A] *Journal of a Voyage for the Discovery of a Northwest Passage from the Atlantic to the Pacific.* When Brown finished the manuscript, he published a pamphlet-form preprint entitled *Chloris Melvilliana* (1823). This was a preprint to *A List of Plants Collected in Melville Island* (Brown, 1824), which appeared with minor revisions as *Appendix XI. Botany* to Parry's (1824) *Supplement to the Appendix of Parry's First Voyage*. Of the 117 taxa of angiosperms, bryophytes, lichens, and fungi accounted for, a total of 10 new genera, 1 new genus combination, 1 new subgenus, 49 new species, 4 new species combinations, and 2 new species names were proposed. Here, typifications are made for the six new taxa proposed in the Brassicaceae.

Eutrema R. Brown, Chlor. Melvill. 9. 1823. TYPE: *Eutrema edwardsii* R. Brown.

Eutrema edwardsii R. Brown, Chlor. Melvill. 9. 1823. TYPE: Canada. Northwest Territories: Melville Island, 1820, *John Edwards s.n.* (lectotype, selected here, BM). Syntype: Canada. Northwest Territories: Melville Island, 1820, *James Ross s.n.* (BM).

There are four different collections on the herbarium sheet historically referred to as the type of *Eutrema edwardsii*. Three in different states of maturity were collected by John Edwards, while the fourth was collected by James Ross. Since *Eutrema edwardsii* was named for John Edwards, and his material shows all the states of maturity that Brown described, they are selected as lectotype. The Ross collection is a syntype.

Parrya R. Brown, Chlor. Melvill. 10. 1823. TYPE: *Parrya arctica* R. Brown (lectotype, selected by Pfeiffer, 1874).

Parrya arctica R. Brown, Chlor. Melvill. 11. 1823. TYPE: Canada. Northwest Territories: Melville Island, 1820 (fr), *William E. Parry s.n.* (lectotype, selected here, BM). Syntypes: Canada. Northwest Territories: Melville Island, 1820 (fl), *James Ross s.n.* (BM); (fl) *Alexander Fisher s.n.* (BM); (fl) *John Edwards s.n.* (BM); (fr) *Edward Sabine s.n.* (BM); (fl) *Edward Sabine s.n.* (BM); (fl) *Anonymous collector s.n.*, but certainly either Parry, Ross, Fischer, Edwards, or Sabine (GH).

On the type sheet of *Parrya arctica*, there are six specimens (listed above) from the Parry (1819–1820) expedition. Since *Parrya* was named for William E. Parry, his specimen is selected as lectotype. The remaining syntypes of Ross, Fisher, Edwards, and Sabine have both fruiting and flowering material, which Brown also certainly examined while describing the species. A specimen at the Gray Herbarium previously identified as the isotype of *Parrya arctica* by Reed C. Rollins is recognizable as a syntype because the original label in Robert Brown's hand-

writing indicates that the specimens came from Parry's first voyage to Melville Island.

Parrya nudicaulis (L.) Regel in Radde, Bull. Soc. Nat. Mosc., XXXIV. 3. 176. 1861. *Cardamine nudicaulis* L., Sp. Pl. II: 654. 1753.

Parrya macrocarpa R. Brown, Chlor. Melvill. 12. 1823. TYPE: "Northwest coast of America: Sledge Island." U.S.A. Alaska: Sledge Island, 25 mi. W of Nome, off the southern coast of the Seward Peninsula at 64°29′N, 166°13′W, 5 Aug. 1778, *David Nelson s.n.* (lectotype, selected here, BM). Figure 1.

In 1778, Captain James Cook's third expedition ventured to what were at the time some of the northernmost points ever achieved in America. On 5 August 1778, David Nelson, a gardener from Kew who accompanied the expedition as a naturalist and plant collector, collected specimens on Sledge Island (Hultén, 1940). Inconspicuously inscribed on the back side of the type sheet of *Parrya macrocarpa* is a very telling statement: "Northwest coast of America: Sledge Island. Dav. Nelson." This clearly identifies this specimen that Brown used to describe *Parrya macrocarpa* as originating from the Cook expedition, with David Nelson as its collector. It is unfortunate, however, that a collection with such a rich history must regarded as a later synonym of *Parrya nudicaulis* (L.) Regel.

Braya Sternberg & Hoppe, Denkschr. Königl.-Baier. Bot. Ges. Regensburg 1: 65. 1815.

Platypetalum R. Brown, Chlor. Melvill. 8. 1823. TYPE: *Platypetalum purpurescens* R. Brown, Chlor. Melvill. 9. 1823 (lectotype, selected here).

Braya purpurascens (R. Brown) Bunge ex Ledebour, Fl. Ross. 1: 195. 1842. Basionym: *Platypetalum purpurescens* R. Brown, Chlor. Melvill. 9. 1823. TYPE: Canada. Northwest Territories: Melville Island, 1820, *James Ross s.n.* (lectotype, selected here, BM). Syntypes: Canada. Northwest Territories: Melville Island, 1820, *John Edwards s.n.* (BM); *Edward Sabine s.n.* (BM); in a box labeled "Flora Arctica, Capt'n. Parry's North Polar Voyage, spec. 11," *William E. Parry? s.n.* (BM).

Platypetalum dubium R. Brown, Chlor. Melvill. 9. 1823. *Braya purpurascens* var. *dubia* (R. Brown) O. E. Schulz, Pflanzenreich, 4, Fam. 105. 235. 1924. TYPE: Canada. Northwest Territories: Melville Island, 1820, in a box labeled "Flora Arctica, Capt'n Parry's 1st Voyage, spec. 12," *William E. Parry? s.n.* (neotype, selected here, BM).

Three specimens from the Parry expedition, all mounted on a single sheet, are enclosed in the type folder of *Platypetalum purpurascens*. These are separate collections made by John Edwards, Edward Sabine, and James Ross at Melville Island. Another specimen from Melville Island, which is also likely a syntype, but without collector data or identifiable handwriting, is in a box labeled "Flora Arctica, Capt'n. Parry's North Polar Voyage." After examination of these specimens and their comparison to the description in *Chloris Melvilliana*, the Ross collection is selected here as the lectotype of *Platypetalum* and of *Platypetalum purpurascens*. The Ross collection consists of four flowering and two fruiting plants, the Edwards of two flowering plants, the Sabine of three flowering plants, and the Parry of one flowering plant. Since the description of *Platypetalum purpurascens* consists of descriptions of both flowering and fruiting material, the Ross collection, the only one with specimens of both states, is selected as lectotype.

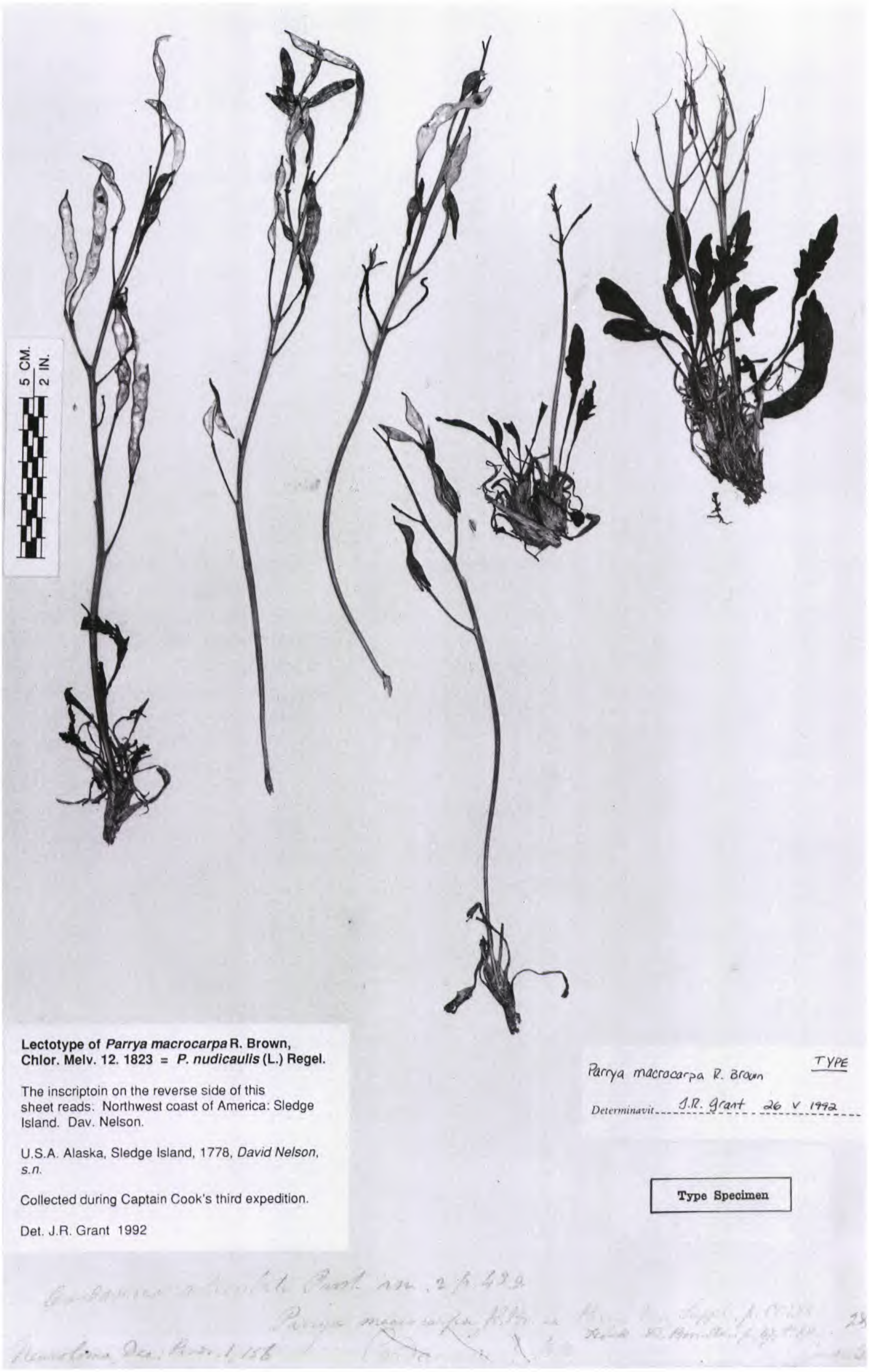
A definitive type of *Platypetalum dubium* cannot be located. The only specimen at BM identified as *P. dubium* is not original material. First, the handwriting on the specimen labeled "Flora Arctica, Capt'n Parry's 1st Voyage, spec. 12" is not that of Robert Brown but an unknown hand. Second, and more importantly, the description of *P. dubium* in *Chloris Melvilliana* stated that the flowers are unknown for the species; that is, the plant was described as fruiting while this BM specimen is a single flowering plant. Therefore, a type of *P. dubium* has not been found, but this does not cause nomenclatural problems because *P. purpurascens* is selected as the lectotype of *Platypetalum*. However, I select a neotype for the species to place it in synonymy with *Braya purpurascens*. Since the above-mentioned specimen was at some point thought to be the type of *Platypetalum dubium*, for whatever reason, I here select it as the neotype of the species.

Acknowledgments. I thank the curators at The Natural History Museum, London (BM), for sending specimens for study, Roy Vickery in particular, and James L. Reveal and James R. Rundell for comments on and review of the manuscript.

Literature Cited

Barrow, J. 1846. Voyages of Discovery and Research Within the Arctic Regions, From the Year 1818 to the Present Time; Under the Command of the Several Naval Officers Employed by Sea and Land in Search of North-west Passage from the Atlantic to the Pacific; With Two Attempts to Reach the North Pole. Abridged and Arranged From the Official Narratives with Occasional Remarks. Harper & Brothers, New York.

Brown, R. 1823. Chloris Melvilliana. A List of Plants Collected in Melville Island (Latitude 74°–75° N.



Lectotype of *Parrya macrocarpa* R. Brown,
Chlor. Melv. 12. 1823 = *P. nudicaulis* (L.) Regel.

The inscriptoin on the reverse side of this sheet reads: Northwest coast of America: Sledge Island. Dav. Nelson.

U.S.A. Alaska, Sledge Island, 1778, *David Nelson, s.n.*

Collected during Captain Cook's third expedition.

Det. J.R. Grant 1992

TYPE

Parrya macrocarpa R. Brown

Determinavit J.R. Grant 26 V 1992

Type Specimen

Figure 1. Lectotype of *Parrya macrocarpa* R. Brown.

Longitude 110°–112°W.) in the Year 1820; By the Officers of the Voyage of Discovery, Under the Orders of Captain Parry. With Characters and Descriptions of the New Genera and Species. W. Clowes, London.

———. 1824. A List of Plants Collected in Melville Island, by the Officers of the Expedition; With Characters and Descriptions of the New Species. Appendix XI Botany. *In:* W. E. Parry, Supplement to the Appendix of Captain Parry's Voyage for the Discovery of a North-west Passage, in the Years 1819–20. Containing an Account of the Subjects of Natural History. John Murray, London.

Hultén, E. 1940. History of botanical exploration in Alaska and Yukon Territories from the time of their discovery to 1940. Bot. Not. 1940: 289–346.

Parry, W. E. 1821. Journal of a Voyage for the Discovery of a North-west Passage from the Atlantic to the Pacific: Performed in the Years 1819–1820, in his Majesty's Ships Hecla and Griper, Under the Orders of William Edward Parry, R. N., F. R. S., and Commander of the Expedition. With an Appendix, Containing the Scientific and Other Observations. John Murray, London.

———. 1824. Supplement to the Appendix of Captain Parry's First Voyage. A Supplement to the Appendix of Captain Parry's Voyage for the Discovery of a North-west Passage, in the Years 1819–20. Containing an Account of the Subjects of Natural History. John Murray, London.

Pfeiffer, L. G. K. 1874. Nomenclator Botanicus. Nominum ad finem anni 1858 publici juris factorum, classes, ordines, tribus, familias, divisiones, genera, subgenera vel sectiones designatium enumeratio alphabetica. Adjectis auctoribus, temporibus, locis systematicis, apud varios, notis literariis atque etymologicis et synonymis conscripsit Ludovicus Pfeiffer. Theodori Fischeri, Casselis [Kassel]. Vol. 2, part 1: 596.

Styrax faberi var. *formosanus*, a New Varietal Combination from Taiwan, China

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ABSTRACT. The new combination *Styrax faberi* var. *formosanus* is proposed, and the taxon is lectotypified.

Styrax faberi Perkins is endemic to China and includes three recognized varieties (Hwang, 1987; Perkins, 1907). The autonym variety is widely distributed in eastern and southeastern China, and there are two locally endemic varieties, one in Hunan and the other in Taiwan. The Taiwan endemic has been referred to as *S. faberi* var. *matsumuraei* (Hwang, 1980, 1987), but at the varietal level *S. rugosus* var. *formosanus* has priority. In preparation for publication of the treatment of Styracaceae for the *Flora of China*, a new combination is made.

Styrax faberi var. **formosanus** (Matsumura) S. M. Hwang, comb. nov. Basionym: *Styrax rugosus* Kurz var. *formosanus* Matsumura, Bot. Mag. (Tokyo) 15: 76. 1901. TYPE: Taiwan (as Formosa). Byolistu, *Honda 31* (lectotype, here designated, TI).

Styrax matsumuraei Perkins in Engler, Pflanzenr. IV. 241 (Heft 30): 34. 1907. *Styrax formosanus* Matsumura var. *matsumuraei* (Perkins) Y. C. Liu, Ligneous Pl. Taiwan 24. 1972. *Styrax faberi* var. *matsumuraei* (Perkins) S. M. Hwang, Acta Phytotax. Sin. 18: 161. 1980. TYPE: same as that of *S. faberi* var. *formosanus*.

Acknowledgment. I thank Bruce Bartholomew for help in the preparation of the manuscript.

Literature Cited

Hwang, S.-M. 1980. A preliminary study on the family Styracaceae from China. Acta Phytotax. Sin. 18: 154–167.

———. 1987. Styracaceae. *In:* Wu Y.-F. & Hwang S.-M., Fl. Reipubl. Popularis Sin. 60(2): 27–150.

Perkins, J. 1907. Styracaceae. *In:* Engler, Pflanzenr. IV. 214 (Heft 30): 1–111.

New Species, a New Name, and Lectotypifications in *Indigofera* L. (Leguminosae: Papilionoideae) from Madagascar

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ABSTRACT. Morphological characters support the description of six new species of *Indigofera* from Madagascar: *I. bemarahaensis* Du Puy & Labat from the Bemaraha Massif (western region), and *I. blaiseae* Du Puy & Labat, *I. bosseri* Du Puy & Labat, *I. imerinensis* Du Puy & Labat, *I. itremoensis* Du Puy & Labat, and *I. zornioides* Du Puy & Labat from various localities in the Central Plateaux. In addition, a new name, *I. peltieri* Du Puy & Labat, is given in place of *I. tulearensis* M. Peltier, a later homonym of *I. tulearensis* Baillon ex Drake, and the species *I. ankaratrensis* and *I. mangokyensis* are lectotypified.

RÉSUMÉ. L'étude des caractères morphologiques permet la description de six nouvelles espèces d'*Indigofera* de Madagascar: *I. bemarahaensis* Du Puy & Labat du Massif du Bemaraha (region ouest), et *I. blaiseae* Du Puy & Labat, *I. bosseri* Du Puy & Labat, *I. imerinensis* Du Puy & Labat, *I. itremoensis* Du Puy & Labat, et *I. zornioides* Du Puy & Labat de différentes localités du Plateau Central. Egalement, un nouveau nom, *I. peltieri* Du Puy & Labat, est donné en remplacement de *I. tulearensis* M. Peltier, un homonyme plus récent de *I. tulearensis* Baillon ex Drake. Les espèces *I. ankaratrensis* et *I. mangokyensis* sont lectotypifiées.

Prior to completion of an account of the Leguminosae subfamily Papilionoideae in Madagascar, six new species are described and illustrated, and a seventh is renamed; two species are lectotypified.

Indigofera L., with about 700 species, is one of the largest genera in the Leguminosae. It is both tropical and subtropical: several species are pantropical or nearly so, and some are widely naturalized as weeds. *Indigofera tinctoria* L., *I. arrecta* Hochstetter ex A. Richard, and some other species yield the traditional dark blue dye indigo. *Indigofera* is very diverse in Madagascar, with 42 species, of which 21 are endemic. They occur all over the island, but are more common in the drier areas, are often tolerant of poor soils, and are often colonizers of disturbed areas. The most recent taxonomic treatment of this genus for tropical Africa, including a broad examination of the genus in Madagascar, remains the revision by Gillett (1958). The systematic studies in African Indigofereae made by Schrire (1991) are also used in this paper for the affinities of the new species described. A recent paper clarified the distinction between the two closely related species *I. spicata* and *I. hendecaphylla*, both of which occur in Madagascar (Du Puy, Labat & Schrire, 1993).

Indigofera ankaratrensis R. Viguier, Not. Syst. (Paris) 13: 366. 1949. TYPE: Central Madagascar. Environs de Vontovoronat à l'est d'Antsirabe, *H. Perrier de la Bâthie 4346* (lectotype, selected here, P; isolectotype, P).

The other syntype of *Indigofera ankaratrensis*, *H. Perrier de la Bâthie 17915*, is treated here as a specimen of *I. imerinensis*.

Indigofera bemarahaensis Du Puy & Labat, sp. nov. TYPE: Western Madagascar. Tsingy de Bemaraha (calcaire de l'Antsingy), E d'Antsalova, vers Bevary, au NE du village, 400–600 m, 4 Fév. 1960 (fr), *J. Leandri & P. Saboureau 2972* (holotype, P; isotypes, K, MO, P). Figure 1.

Frutex deciduus pilis bifidis fuscis albisque immixtis. Folia foliolis alternis 9–11, stipulis ca. 2 mm longis anguste triangularibus; foliola ovata ad elliptica, plerumque 10–40 × 6–20 mm, infra pallidiora. Calyx brevis. Tubus staminum 5–6 mm longus. Legumina saepe solitaria vel pauca, patentia, lineari-oblonga, 40–70 mm longa, crassa et rigida, subangularia, rostrata, 7–11-sperma.

Figure 1. *Indigofera bemarahaensis* Du Puy & Labat (*Leandri & Sabourеau, 2972*, P). —A. Habit. —B & B'. Pod and seed.

A deciduous woody shrub forming distinct, scale-covered dormant buds; stems woody, thinly strigose when young, soon glabrescent, with short zones of scars and remains of bud scales at the base of each annual growth, brachyblasts few. Biramous hairs medifixed, appressed, stiff, both white and brown mixed. Leaves with 9–11 alternate leaflets, sometimes subopposite on some leaves; stipules ca. 2 mm long, narrowly triangular, the margins scarious and glabrous, but fringed with trichomes; stipels absent, the leaflet axils often with tufts of glandular trichomes; leaflets ovate to elliptic, increasing in size toward the leaf tip, mostly 10–40 × 6–20 mm, thinly strigose on both surfaces or glabrous above, paler beneath (especially when dried). Racemes mostly axillary from near the base of new shoots, pedunculate, 25–75 mm long (in fruit); bracts caducous. [Flowers not known.] Calyx short, ca. 1 mm long, less than a quarter as long as the staminal sheath, white strigose; teeth short, triangular, about as long as the tube. Staminal sheath 5–6 mm long. Pods often solitary or few, spreading, linear-oblong, 40–70 mm long, thick and rigid, rather angular, beaked, sparsely strigose, splitting into 2 spiralling valves, with 7–11 seeds. [Mature seeds not known.]

Affinities. The woody stems, indumentum of mixed brown and white medifixed hairs, leaves with alternate leaflets, short calyx, relatively long staminal sheath, and similar pods indicate that *I. bemarahaensis* is related to *I. leucoclada* Baker, a distinctive species also endemic to Madagascar.

Distribution. Western Madagascar, confined to the Bemaraha Massif.

Habitat. In deciduous scrub or open woodland on limestone outcrops or "tsingy."

Flowering time. Not known, but probably prior to November.

The specific epithet refers to the Reserve of the Tsingy of Bemaraha where all four known collections originated.

Paratypes. MADAGASCAR. Environs de Tsiandro (Ouest), forêt de Behandrao, 500–600 m, 28 Nov. 1952 (fr), *Leandri, Capuron & Razafindrakoto 1943* (P); calcaire de l'Antsingy, E d'Antsalova, vers Bevary, sentier vers Tsiandro, 400–600 m, 31 Jan. 1960 (fr), *Leandri & Saboureau 2887* (NY, P, WAG); Antsalova, 27 Fév. 1960 (fr), *Réserve Naturelle (Botoalina) 11095-RN* (K, MO, P, TEF).

Indigofera blaiseae Du Puy & Labat, sp. nov. TYPE: South-central Madagascar. Isalo Massif, NW of Ranohira, area of "La Piscine," 45°21′E, 22°33′S, 850 m, 16 Feb. 1990 (fl, fr), *D. J. & B. P. Du Puy, J.-N. Labat & B. Rakouth M468* (holotype, K; isotypes, MO, P, TAN). Figure 2.

Frutex parvus tenellus caule singulari erecto basali, saepe apice ramificanti. Ramuli subglabri, rufo-brunnei. Folia glandulis fasciculatis vice stipellorum et proxime stipulorum; foliola elliptica. Inflorescentia longa et gracilis, breviter pedunculata. Flores 8–9 mm longi, cerasini. Calyx parvus, ca. 1.5 mm longus usque ad quartum tubi staminalis attingens. Ovaria et legumina glabra ad sparsim strigosa; legumina (5–)6–9-sperma.

A small, delicate shrub, 20–150 cm tall, often branching from the apex of a single, erect basal stem; stems slender, woody, much branched, somewhat ridged, thinly strigose and soon glabrescent, red-brown. Biramous hairs medifixed or almost so, appressed, stiff, mixed white and brown. Leaves with (9–)11–19 paired leaflets, the leaves subtending the racemes not reduced; stipules minute, less than 1 mm long, accompanied by and sometimes appearing to be replaced by clusters of glandular trichomes; stipels replaced by clusters of subsessile glandular trichomes. Leaflets elliptic to narrowly elliptic, 6–12(–14) × 2–5(–6) mm, the apex rounded to obtuse and finely mucronate, glabrous to sparsely strigose above, sparsely white strigose beneath, gray-green above, paler gray beneath. Racemes spreading horizontally to subpendulous, long and slender, 50–200 mm long, much longer than the leaves, laxly many-flowered; peduncle and axis wiry, the peduncle much shorter than the subtending leaves, 7–15 mm long; pedicels long and slender, 4–7 mm long; bracts subulate, less than 1 mm long, caducous. Flowers 8–9 mm long, cerise pink, the standard with a white basal eye and whitish to fulvous behind. Calyx small, ca. 1.5 mm long, up to a quarter as long as the staminal sheath, thinly strigose with fine, brown hairs; teeth short, triangular, shorter than the tube. Standard densely but finely strigose with fulvous hairs behind. Staminal sheath 6–7 mm long. Ovary glabrous to thinly strigose. Pods pendulous, with the pedicels somewhat pointing toward the inflorescence tips, linear-cylindrical, (17–)20–32 mm long, beaked, glabrous or glabrescent if sparsely strigose when immature, chestnut brown, glossy, splitting into 2 spiralling valves, with (5–)6–9 seeds. Seeds barrel-shaped, ca. 1.5–2.5 × 1.2–1.5 mm, finely pitted.

Affinities. Indigofera blaiseae has previously been confused with *I. pedunculata* Hilsenberg & Bojer ex Baker. It differs in its subglabrous, red-brown twigs, its dense clusters of subsessile glandular trichomes which replace the stipels and accompany

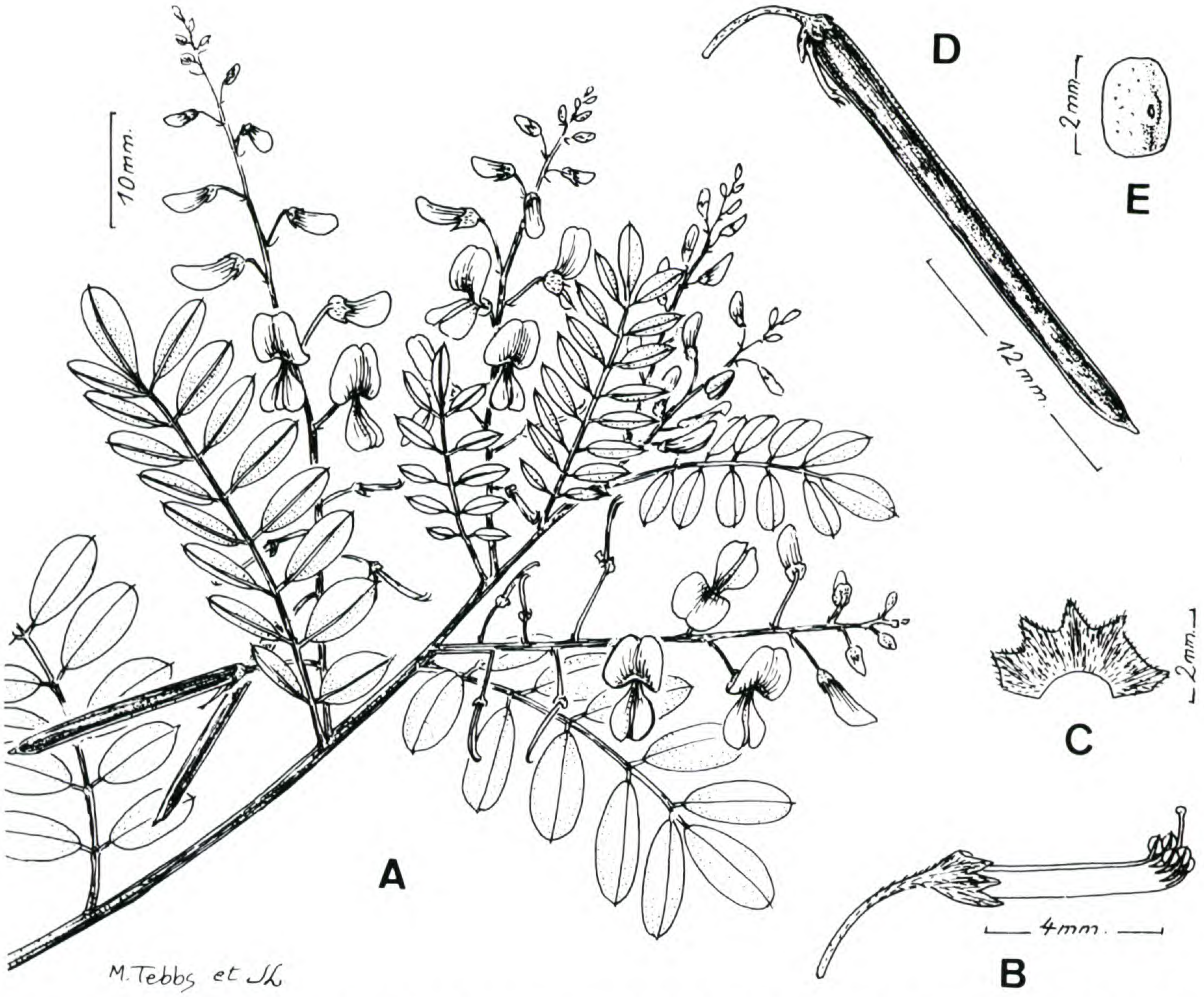

Figure 2. *Indigofera blaiseae* Du Puy & Labat (*D. J. & B. P. Du Puy, Labat & Rakouth M468*, K). —A. Habit. —B. Calyx and staminal sheath. —C. Calyx. —D. Pod. —E. Seed.

the stipules, its more broadly elliptic leaflets, its short peduncles, its shorter calyx teeth, its glabrous to sparsely strigose ovaries and pods, and its pods with fewer seeds. It also differs in its more branched and woody growth habit, its paler flowers, and its lack of reduced leaves subtending the racemes. These two species occur together in the Isalo Massif, but *I. pedunculata* has a much wider distribution in the Central Plateau. *Indigofera blaiseae* is closely related to *I. dendroides* Jacquin from Africa, differing in its longer staminal sheath (and larger flower size), its racemes with shorter peduncles, and its much less densely strigose pods.

Distribution. South-central Madagascar, confined to the Isalo Massif.

Habitat. In grassland and open *Uapaca* woodland, on sandstone and sandy soils, at 800–1,100 m altitude.

Flowering time. (October) January–March.

Vernacular name. Kirikisa.

This species is dedicated to Blaise Du Puy, one of the collectors of the type specimen. She has studied and collected widely in Madagascar, and has worked with enthusiasm for conservation of the Malagasy flora, particularly through the Parc de Tzimbazaza.

Paratypes. SOUTH-CENTRAL MADAGASCAR. Isalo, Ranohira, Fév. 1956 (fl), *Bosser 9147* (P); Isalo, près de Ranohira, Fév. 1963 (fl, jfr), *Bosser 17402* (P); Isalo, vers le km 710, 800 m, 29 Jan. 1955 (fl, jfr), *Cours 5025* (MO, P); Isalo, Ranohira, 4 Mar. 1943 (fl, jfr), *Decary 18939* (K, P); Isalo Massif, valley containing "La Piscine" (Angaraboka), Ampandrabe, 45°21′E, 22°33′S, 850 m, 8 May 1989 (fr), *D. & B. Du Puy, M221* (K, P, TAN); Plateau de l'Isalo, Col des Tapias au S-W de Ranohira, vers 1,000 m, Oct. 1933 (fl, jfr), *Humbert 11219* (K, MO, P); Plateaux et vallées de l'Isalo à l'W de Ranohira, 800–1,250 m, 29 Jan.–2 Fév. & 8–10 Avr. 1955 (fl, fr), *Humbert 28655* (K, MO, P, PRE); Prov. de Fianarantsoa, Massif de l'Isalo, à l'E de Ranohira, près d'Andohakandrareza, S-E de "La Piscine," 22°33′S, 45°21′E, 800–900 m, 14 Fév. 1990 (fl, fr), *Labat, B. & D. Du Puy & Rakouth 2121* (K, MO, NY, P, TAN); Isalo, Fév. 1967 (fl, fr), *Morat 2579* (P); Isalo, Mar. 1970 (fl), *Morat 3468* (P); Isalo, Ilakaka, 21 Fév. 1961 (fl, fr), *Peltier & Peltier 2989* (K, P); Isalo, 16 Avr. 1965 (fl, fr), *Peltier & Peltier 5517* (P).

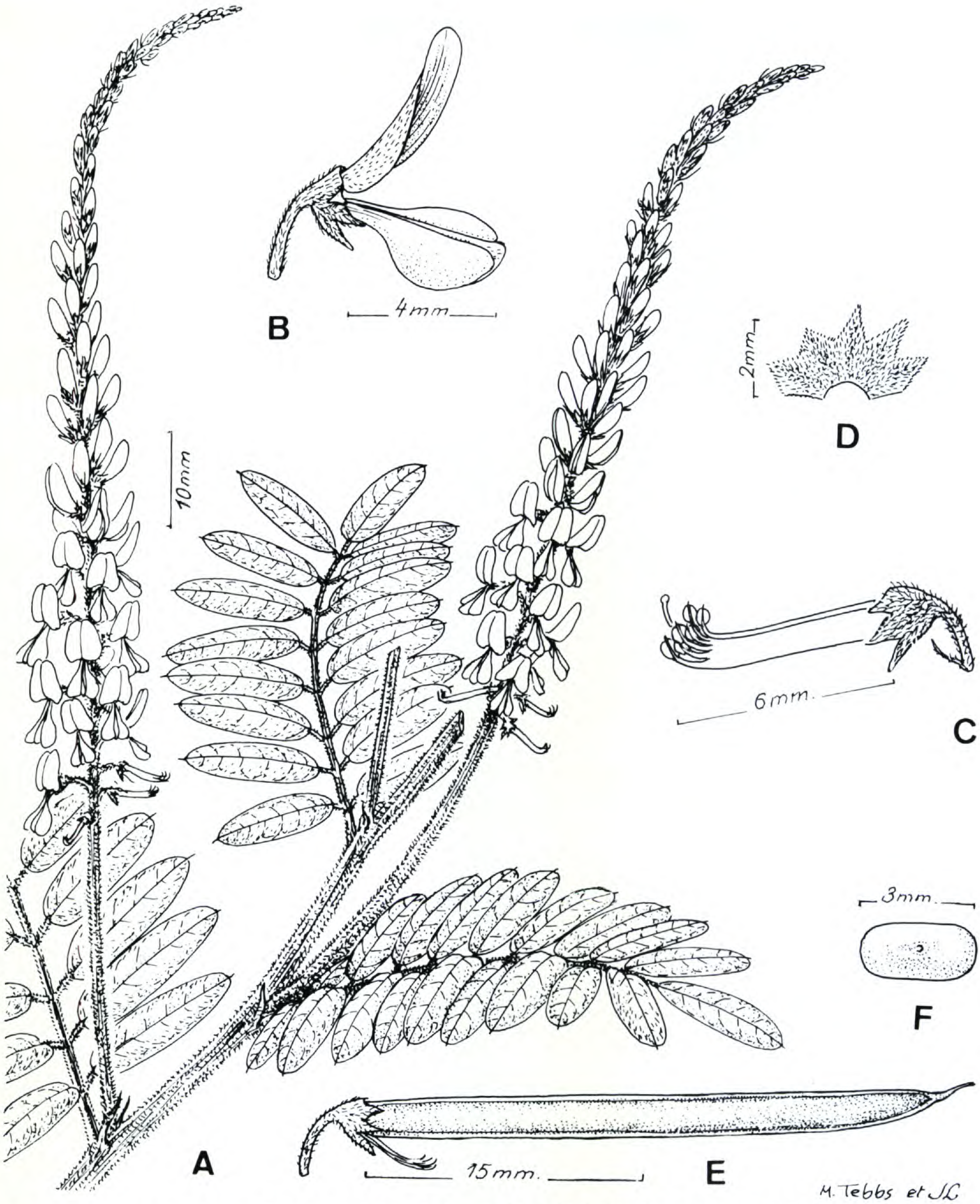

Figure 3. *Indigofera bosseri* Du Puy & Labat (*Labat, B. P. & D. J. Du Puy & Rakouth 2116*, P). —A. Habit. —B. Flower. —C. Calyx and staminal sheath. —D. Calyx. —E. Pod. —F. Seed.

Indigofera bosseri Du Puy & Labat, sp. nov. TYPE: South-central Madagascar. Prov. Fianarantsoa, Route Nat. 7 entre Sakaraha et Ranohira, 300 m E d'Ilakaka, 22°41′S, 45°14′E, 750 m, 13 Fév. 1990 (fl), *J.-N. Labat, B. P. & D. J. Du Puy & B. Rakouth 2116* (holotype, P; isotypes, BR, K, MO, NY, P, PRE, TAN, WAG). Figure 3.

Frutex 1–2.5 m altus. Folia foliolis 17–23. Inflorescentia plerumque 10–20 cm longa, aspectu ravido, gracilis et subtiliter descrescens bracteis alabastra non excedentibus. Flores 8–9 mm longi, profunde rosei. Calyx quartum tubi staminalis non attingens, dentibus brevibus usque ad tubi calycis aequilongus. Tubus staminalis ca. 7 mm longus. Ovaria et legumina glabra.

An evergreen, softly woody shrub 1–2.5 m tall;

twigs densely velvety pubescent, the young tips white to slightly fulvous. Biramous hairs mostly very unequally branched, the long branch suberect and crisped giving a velvety pubescence, mostly white. Leaves with 17–23 paired leaflets; stipules subulate, 5–9 mm long; stipels minute, often hidden among the hairs on the rachis, associated with tufts of trichomes. Leaflets narrowly oblong-elliptic to oblong-ovate, 15–30 × 6–10 mm, with an apical mucro ca. 1 mm long, densely but shortly pubescent above and beneath, gray-green to silvery. Racemes ascending, very long and slender, mostly 10–20 cm long, usually longer than the leaves, the tips white, slender and narrowly tapering; bracts ca. 2–3 mm long, shorter than the buds, not or hardly exserted in the young raceme tips, caducous. Flowers 8–9 mm long, deep pink, the standard crimson with a white basal eye and deep red behind, the wings fuchsia pink, the keel crimson. Calyx ca. 2 mm long, about a quarter as long as the staminal sheath, white hairy; teeth triangular, shorter than to about as long as the tube. Standard densely crisped-pubescent with white to red (not brown or fulvous) hairs behind. Staminal sheath ca. 7 mm long. Ovary glabrous. Pods linear-cylindrical, 30–48 mm long, rigid and beaked, glabrous and glossy, splitting into 2 spiralling valves, with 6 or 7 seeds. Seeds large, oblong-ellipsoidal, ca. 3.5 × 2 mm, finely pitted to smooth.

Affinities. Indigofera bosseri is related to *I. lyallii* Baker and *I. mangokyensis* R. Viguier, but it can be distinguished by its longer, more slender and more finely tapering inflorescences with bracts that do not exceed the developing buds, its larger flowers with a longer staminal sheath, its smaller calyces less than a quarter as long as the staminal sheath with shorter teeth up to as long as the calyx tube, the grayish appearance of its inflorescences due to white rather than brown hairs on the calyces, bracts, and backs of the standard petals (sometimes similar in *I. mangokyensis*), and by its more slender pods. It further differs from *I. mangokyensis* by its glabrous ovaries and pods.

Distribution. South-central and west-central Madagascar, mainly collected in the Isalo Massif, also recorded in the central Mania River basin around the Itremo Massif and the hills west of Antsirabe.

Habitat. In grassland, seasonal river gullies, on rocky outcrops and roadsides, on sandstone and granite, at 600–1,000 m altitude.

Flowering time. January–March.

This species is dedicated to Jean Bosser, in recognition of his outstanding contributions to Malagasy botany through collection, curation, and research.

Paratypes. SOUTH- AND WEST-CENTRAL MADAGASCAR. Isalo, Ranohira, PK 713, Mar. 1964 (fr), *Bosser 19132* (K, MO, P); Plateaux de l'Isalo, à l'E de Ranohira, 800–1,000 m, 30 Juil. 1928 (fr), *Humbert & Swingle 4983* (K, MO, P); entre Mandrosonavo et Amborompotsy, route de Morondava, Fév. 1973 (fl), *Morat 4177* (P); Prov. of Toliara, along Route Nationale 7, at Isalo, 22°37′S, 45°23′E, 810 m, 23 Mar. 1991 (fl, jfr), *Miller & Randrianasolo 6098* (MO, P, TAN); Route Betafo-Mandato, pont du km 97, 18 Mar. 1960 (fl), *Peltier & Peltier 2049* (K, P); Isalo, 22 Fév. 1961 (fl), *Peltier & Peltier 3005* (K, MO, P); Isalo, bord de la piste partant du km 715 vers l'W, 12 Avr. 1961 (fr), *Peltier, Peltier & Montagnac 3017* (K, P); W de Midongy, 600 m, Fév. 1919 (fl), *Perrier de la Bâthie 12506* (P, one of three syntypes of *I. mangokyensis*); without locality, *Service Forestier 1381-SF.*

Indigofera imerinensis Du Puy & Labat, sp. nov. TYPE: Central Madagascar. Antananarivo Prov., facade E du Massif de l'Ankaratra, village d'Ankaratra à l'E d'Ambatolampy, 19°21′S, 47°20′E, 1,700–2,000 m, 28 Jan. 1990 (fl, fr), *J.-N. Labat, P. Phillipson & P. P. Lowry 2021* (holotype, P; isotypes, K, MO, P, TAN). Figure 4.

Species distincta aspectu longirepenti, prostrato; pilis biramosis omnio albis, pagina superiore foliolorum inequali-ramosis; in multis speciminibus praesentia trichomatum brevium glandulosorum; foliolis latis rotundatis; gemmis, floribus et leguminibus parum deflexis; et leguminibus brevibus strigosis.

A perennial, spreading herb; stems prostrate, radiating from a central woody rootstock, strigose and sometimes with dense, short, glandular trichomes. Biramous hairs mostly medifixed, appressed, stiff, white, often mixed with short glandular trichomes. Leaves with (5–)7–9 paired leaflets; petiole 1–3 mm long, the petiole and rachis sometimes densely glandular; stipules subulate, 2–3 mm long, sometimes glandular; stipels minute, associated with or replaced by a few trichomes; leaflets elliptic to obovate, 4–10 × 3–7 mm, rounded at the base and apex, strigose above and beneath, the biramous hairs on the upper surface erect and often with unequal branches. Racemes ascending, 30–60 mm long, many-flowered, the flowers and buds somewhat deflexed; peduncles 10–20 mm long, the pedicels and axis sometimes glandular. Flowers ca. 4 mm long, red, the standard whitish behind, the keel whitish. Calyx 1.5–3 mm long, about half as long as the staminal sheath, with white biramous hairs and often with very dense, short glandular trichomes; teeth slender, subulate, longer than the tube. Standard white strigose behind and usually with short glandular trichomes. Staminal sheath 3–4 mm long. Ovary strigose. Pods somewhat deflexed, cylindrical, 8–14 mm long, white strigose, not glandular, split-

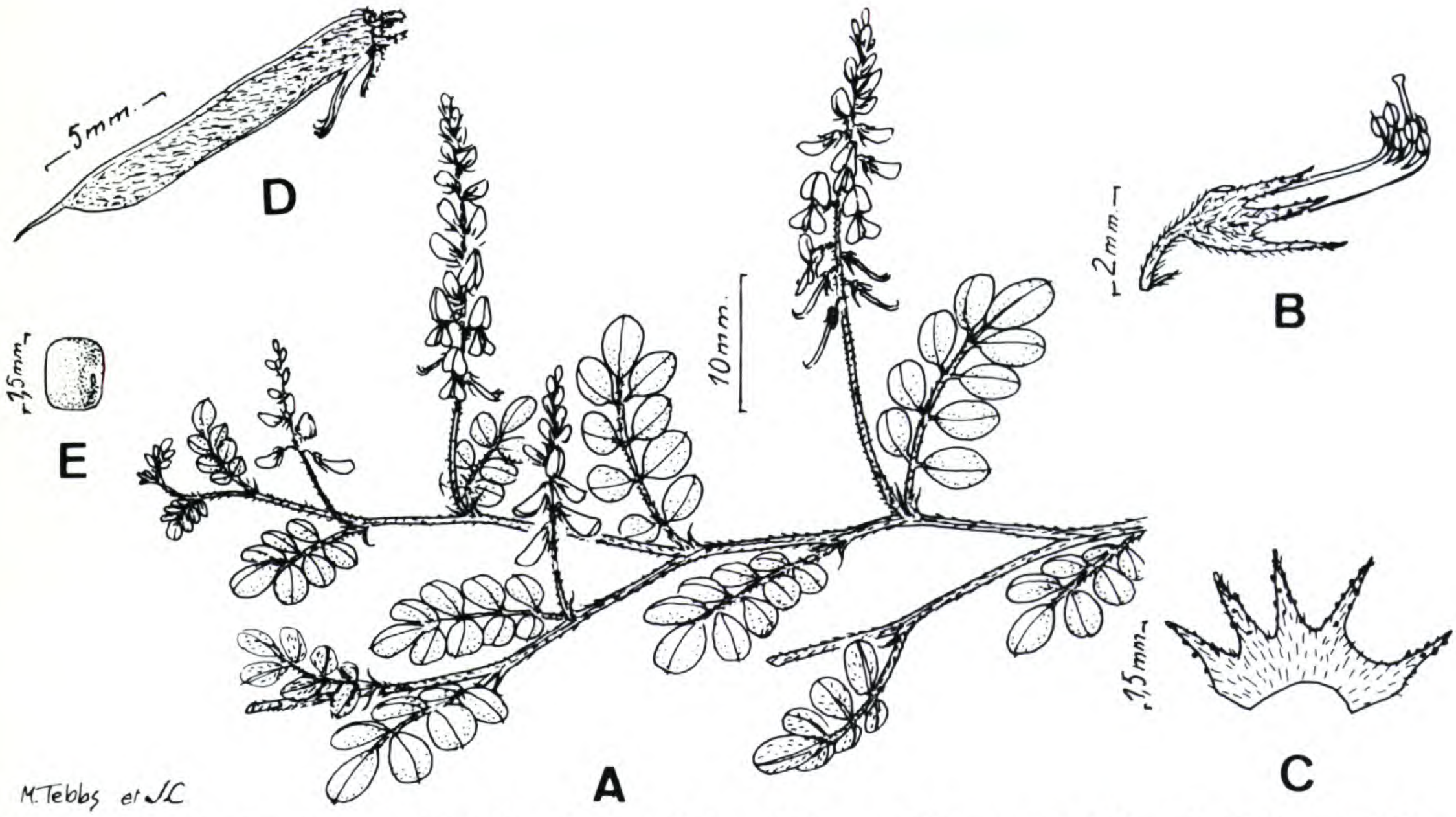

Figure 4. *Indigofera imerinensis* Du Puy & Labat (*Labat, Phillipson & Lowry 2021*, P). —A. Habit. —B. Calyx and staminal sheath. —C. Calyx. —D. Pod. —E. Seed.

ting into 2 valves, with 4–6(–8) seeds. Seeds cuboid, ca. 1.1–1.3 × 1 mm, smooth.

Affinities. Indigofera imerinensis is closely allied to the African species *I. mimosoides* Baker, especially variety *viscidior* Gillett, which it resembles somewhat in its rather short glandular trichomes and perennial growth habit. *Indigofera mimosoides* usually differs in having a more upright and often annual habit, its usually very long glandular trichomes, its longer calyx lobes, and its flowers and pods which are not deflexed; variety *viscidior* differs in its much more dense and strongly glandular trichomes which also occur on the leaflet midvein and margins, its narrower leaflets, and its erect habit. The degree and distribution of glandular trichomes is very variable: the most densely glandular specimens have numerous short, glandular trichomes on the stems, stipules, leaf rachises and petioles, inflorescences, calyces, and the exterior of the standard petals (this last character is unique in Madagascar); intermediate specimens have the trichomes mainly confined to the calyces, standard, and stipules; some specimens are almost entirely eglandular. In view of the variation encountered in related species in Africa, this variation in Madagascar is included here within a single species. *Indigofera imerinensis* resembles the sympatric *I. stenosepala* Baker, which can be distinguished by its upright habit, the presence of brown biramous hairs especially on the inflorescence, calyces, and standard petals, its longer glandular trichomes which are much less dense on the calyx and never occur on the standard petal or pods, and its equally branched biramous hairs on the upper surface of the leaflets.

Distribution. Central Madagascar, on the Central Plateaux from Antananarivo and Lake Itasy to Ambositra, including Antsirabe and the Ankaratra Massif.

Habitat. Disturbed areas such as tracksides and dykes of old rice fields, on lateritic soils, at 1,200–1,800 m altitude.

Flowering time. December–March.

The specific epithet refers to the Imerina region of Central Madagascar, where the known collections originated.

Paratypes. CENTRAL MADAGASCAR. Ambohimandroso (Ambatolampy), 1,500 m, Déc. 1955 (fl), *Bosser 8811* (P); entre Arivonimamo et Soamananety, 26 Déc. 1959 (fl), *Peltier & Peltier 1668* (P); Faratsiho, 26 Fév. 1960 (fl), *Peltier & Peltier 1952* (K, P); District d'Ampanifotsy, Ilempona, 26 Fév. 1960 (fl), *Peltier & Peltier 1959* (MO, P); District d'Antsirabe, Andranobe, 19 Mar. 1960 (fl), *Peltier & Peltier 2129* (P); Amboasary, R.N. 7, km 36, 28 Déc. 1963 (st), *Peltier & Peltier 4527* (P); R.N. 7, km 127, vers Ambohilany, 17 Fév. 1964 (fl, fr), *Peltier & Peltier 4652* (K, P); Ambalamanakana, R.N. 7, entre Ambositra et Ambohimehasoa, 18 Fév. 1964 (fl, jfr), *Peltier & Peltier 4665* (P); Antsirabe, 1,600 m, Avr. 1912 (fr), *Perrier de la Bâthie 4156* (P); Antsirabe, 1,500 m, Jan. 1914 (fl), *Perrier de la Bâthie 4802* (P); environs d'Ambatolampy, 1,600 m, Fév. 1927, *Perrier de la Bâthie 17915* (P, one of two syntypes of *I. ankaratrensis*).

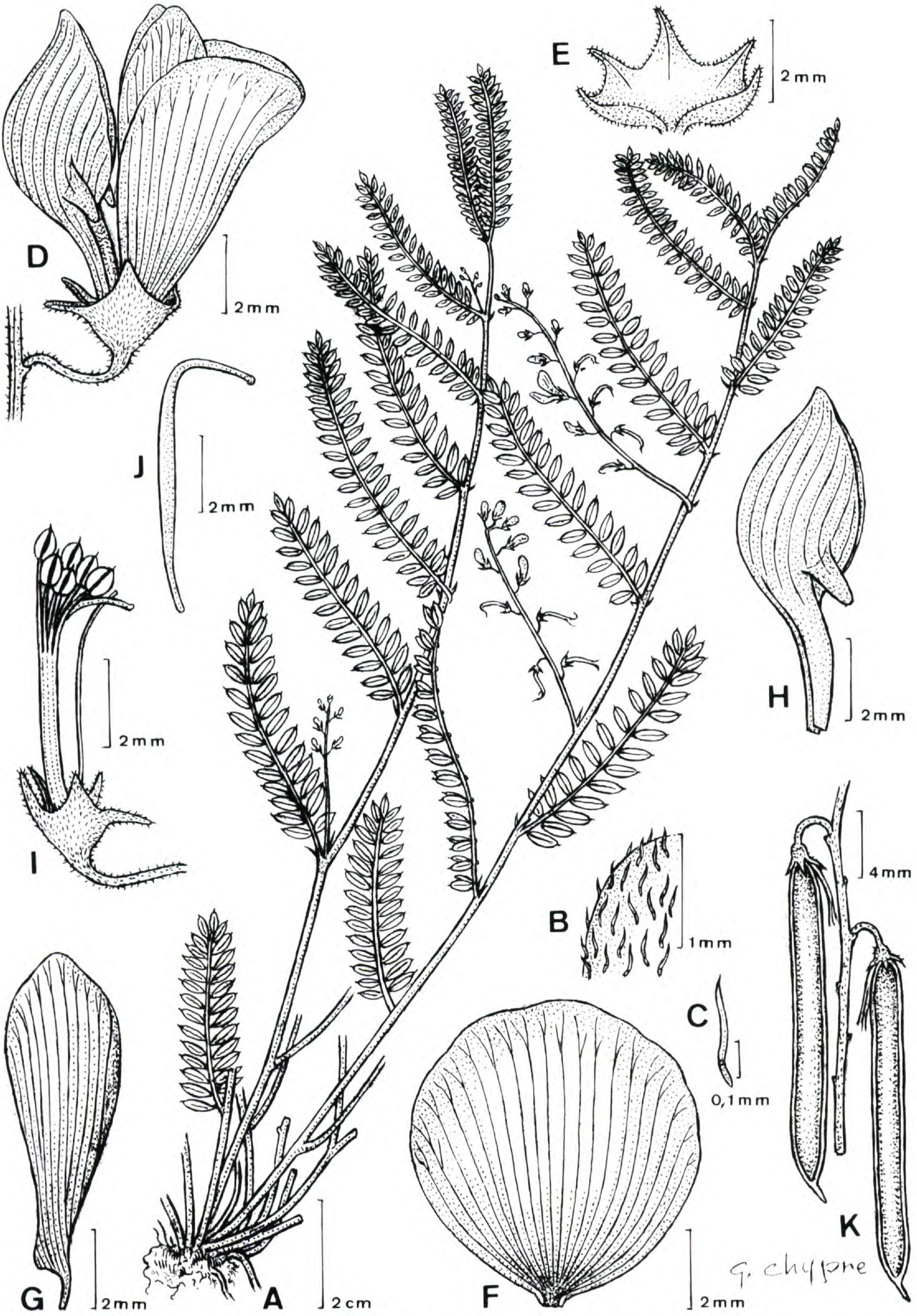

Figure 5. *Indigofera itremoensis* Du Puy & Labat (*Perrier de la Bâthie 12401*, P). —A. Habit. —B. Leaflet portion with medifixed hairs. —C. Medifixed hair. —D. Flower. —E. Calyx. —F. Standard (exterior). —G. Wing. —H. Keel. —I. Calyx with staminal sheath. —J. Ovary. —K. Pods.

Indigofera itremoensis Du Puy & Labat, sp. nov. TYPE: West-central Madagascar. Ambatofangena [probably Ambatofangehana, E slopes of the Itremo Massif, 47°01′E, 20°30′S], *H. Perrier de la Bâthie 12401* (holotype, P; isotypes, K, P). Figure 5.

Species distincta aspecto prostrato; foliis foliolis pernumerosis, 15–31; inflorescentiis longis folia excedentibus, 40–160 mm longis; floribus grandibus 7–8 mm longis; ovario et leguminibus glabris.

A perennial, creeping herb; stems prostrate, radiating from a woody rootstock, with sparse biramous hairs. Biramous hairs mostly slightly unequal-branched, stiff, white to yellowish. Leaves with 15–31 paired leaflets; stipules subulate, ca. 3 mm long, often with sparse, minute glands on the margins; stipels absent, replaced by tufts of glandular trichomes; leaflets elliptic, ca. 4–6 × 2–3 mm, glabrous above or with scattered biramous hairs with unequal branches, thinly strigose and paler beneath (on herbarium specimens). Racemes ascending, long and lax, 40–160 mm long, pedunculate, with numerous flowers; peduncles 15–40 mm long; pedicels 2.5–4 mm long, reflexed; bracts 1.5–2 mm long, often with a few minute glands on the margins, caducous. Flowers large, 7–8 mm long, purple-red. Calyx small, 1.5–2 mm long, about a quarter as long as the staminal sheath, strigose; teeth triangular, about as long as the tube. Standard with minute, crisped biramous hairs behind. Staminal sheath 6–7 mm long. Ovary glabrous. Pods deflexed, linear-cylindrical, 15–25 mm long, beaked, glabrous, red-brown, with ca. 4–8 seeds. [Seeds not known.]

Affinities. *Indigofera itremoensis* appears to be related to *I. ankaratrensis* R. Viguier and *I. thymoides* Baker, but it may be recognized by its prostrate growth habit, its leaves with very numerous leaflets, its long inflorescences exceeding the leaves, its large flowers, and its glabrous ovary and pods.

Distribution. West-central Madagascar, only known from the Itremo Massif and surrounding hills, west of Ambositra.

Habitat. Exposed situations among quartzite rocks, at 1,500–2,000 m altitude.

Flowering time. January–February.

The specific epithet refers to the Itremo Massif and surrounding hills where the three known collections originated.

Paratypes. WEST-CENTRAL MADAGASCAR. Montagnes à l'W d'Itremo, W Betsileo, 1,500–1,700 m, 17–22 Jan. & 18–22 Avr. 1955 (fl), *Humbert 28234* (K, P); Mont Analamamy, 2,000 m, Fév. 1919 (fl, fr), *Perrier de la Bâthie 12478* (P).

Indigofera mangokyensis R. Viguier, Not. Syst. (Paris) 13: 364. 1949. TYPE: Madagascar. Central Madagascar, Bassin du Mangoky, Haut Zomandao, *H. Perrier de la Bâthie 4210* (lectotype, selected here, P; isolectotype, P).

One of the three syntypes of *Indigofera mangokyensis*, *H. Perrier de la Bâthie 12506*, is considered here to be a specimen of *I. bosseri*, and another, *Humbert 6560*, of *I. lyalli*.

Indigofera zornioides Du Puy & Labat, sp. nov. TYPE: Central Madagascar. Ambohimandroso près d'Ambatolampy, 1,500 m, Dec. 1955 (fl, fr), *J. Bosser 8814* (holotype, P; isotype, TAN). Figure 6.

Herba prostrata perennis; caules alis angustis membranaceis. Folia simplicia, fere sessilia, 5–14 × 2–4.5 mm. Racemi longi et laxi, plerumque 50–100 mm longi, pedunculo longissimo et gracili. Flores 3.5–4 mm longi, rubentes. Vexillum facie posteriori strigosum; alae carina multo longiores. Legumina patentia, parva, anguste cylindrica.

A prostrate, perennial herb; stems long-creeping and few-branched, slender (ca. 1 mm broad), flattened, with narrow, membranous wings, thinly strigose. Biramous hairs all medifixed, mainly white, stiff. Leaves simple; stipules triangular, 1–1.5 mm long; stipels absent. Leaf lamina almost sessile, narrowly oblong to oblong-ovate, 5–14 × 2–4.5 mm, base rounded, apex obtuse, thinly appressed-strigose above and beneath. Racemes long and lax, mostly 50–100 mm long, the peduncle very long and slender, ca. 30–70 mm long; bracts ca. 1 mm long, caducous; pedicels 3–4 mm long. Flowers 3.5–4 mm long, the wings much longer than the keel, reddish. Calyx ca. 1.5 mm long, about half as long as the staminal sheath, thinly white strigose; teeth narrowly triangular, about as long as the tube. Standard white to yellowish strigose behind. Staminal sheath ca. 2.5 mm long. Ovary strigose. Pods spreading, small, narrowly cylindrical, 5–9 mm long, sparsely white strigose, splitting into 2 spiralling valves, with 4–6 seeds. [Seeds not known.]

Affinities. This distinctive species appears to be endemic to Madagascar. It can be easily recognized by its simple, almost sessile leaves, its flattened, creeping stems, and its long, wiry inflorescences. It may be placed in section Dendroides due largely to its long, lax racemes with very long, wiry peduncles and its relatively long pedicels. However, the lack of dark brown biramous hairs on the back of the standard is unusual in this group.

Distribution. Central Madagascar, only known

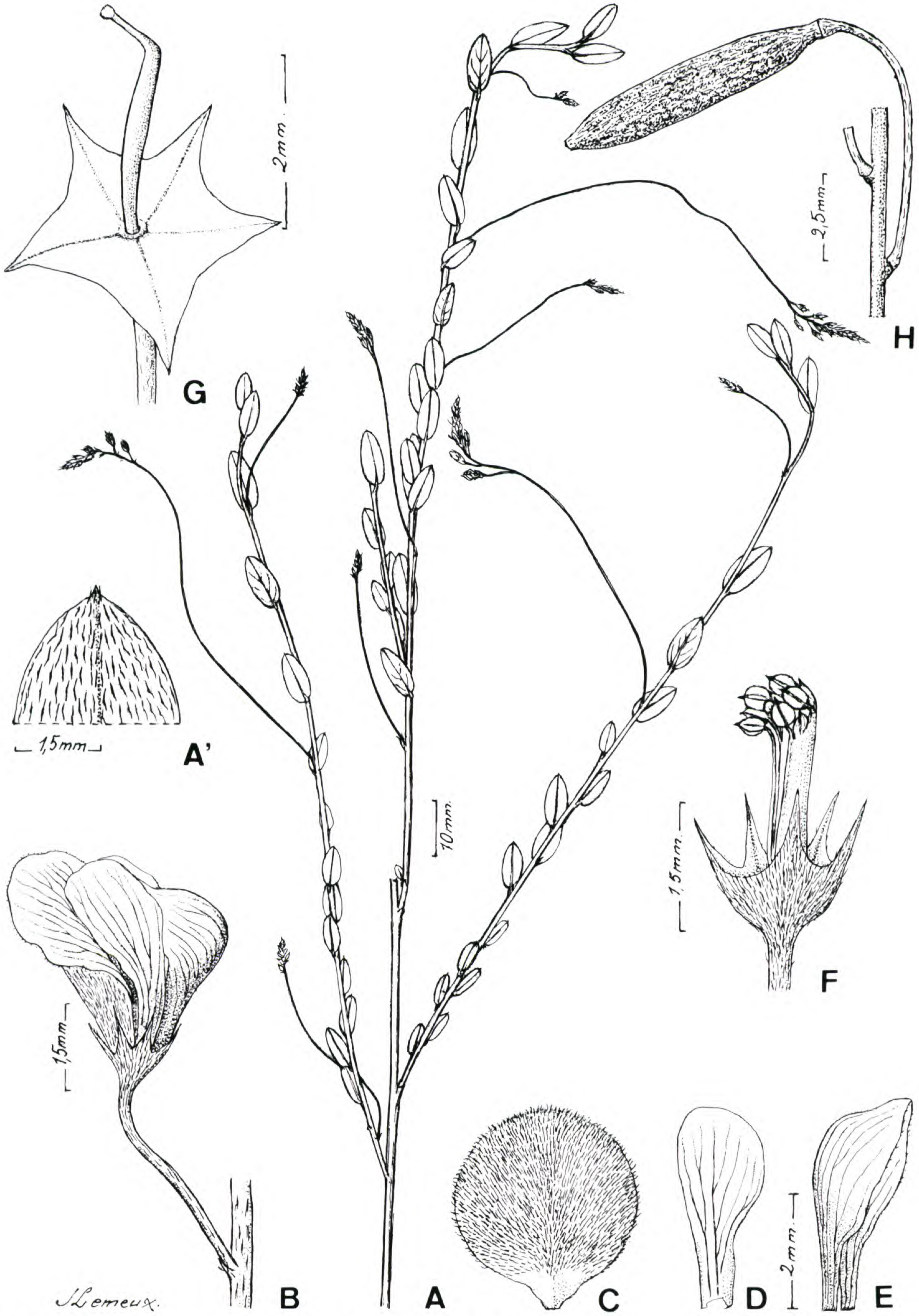

Figure 6. *Indigofera zornioides* Du Puy & Labat (*Bosser 8814*, P). —A. Habit. —A'. Leaflet apex and medifixed hairs. —B. Flower. —C. Standard (exterior). —D. Wing. —E. Keel. —F. Calyx and staminal sheath. —G. Open calyx and ovary. —H. Pod.

from near Ambatolampy and the Col des Tapias north of Ambositra.

Habitat. In grassland or rocky outcrops in grassland, at ca. 1,500 m altitude.

Flowering time. December.

The specific epithet refers to the close, alternate arrangement of the leaves along the stem, reminiscent of the bracts in the inflorescences of *Zornia* species.

Paratype. CENTRAL MADAGASCAR. Col des Tapias, 45 km avant Ambositra, Déc. 1963 (fl), *Bosser 18612* (P, TAN).

Indigofera peltieri Du Puy & Labat, nom. nov. Replaced name: *Indigofera tulearensis* M. Peltier, Adansonia, sér. 2, 5: 429. 1965, not *Indigofera tulearensis* Baillon ex Drake (1903). TYPE: Southern Madagascar. Km 2 d'Ambohimahavelona (Tulear) [Toliara], *J. Peltier & M. Peltier 2951* (holotype, P).

This species is dedicated to Maurice Peltier, in recognition of his contributions to the study of the Papilionoideae of Madagascar.

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Literature Cited

Du Puy, D. J., J.-N. Labat & B. D. Schrire. 1993. The separation of two previously confused species in the *Indigofera spicata* complex. Kew Bull. 48: 727–733.

Gillett, J. B. 1958. *Indigofera* (*Microcharis*) in tropical Africa, with the related genera *Cyamopsis* and *Rhynchotropis*. Kew Bull., Addit. Ser. 1: 1–166.

Schrire, B. D. 1991. Systematic studies in African Indigofereae (Leguminosae–Papilionoideae). Ph.D. Thesis, University of Natal, Pietermaritzburg.

Una Nueva Especie de *Metteniusa* Karsten (Metteniusaceae) de Colombia

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RESUMEN. Una nueva especie de *Metteniusa* es descrita e ilustrada: *M. cogolloi*. También se estudia e ilustra la anatomía de la hoja; una de las más llamativas diferencias es la presencia de una hipodermis, no encontrada en las otras especies del género.

ABSTRACT. A new *Metteniusa* species is described and illustrated: *M. cogolloi*. In the study of the leaf anatomy, one of the more important differences is the presence of the hypodermis, not found in the other species.

Metteniusaceae es una familia neotropical con un solo género (*Metteniusa*); hasta hace muy poco sólo era conocida de Suramérica, desde los Andes Orientales del Perú, Ecuador, Colombia y Venezuela. Actualmente se ha herborizado en la Cordillera Occidental de Colombia y de la Cordillera de Talamanca, en Costa Rica. La mayor diversidad del género se encuentra en Colombia, endonde se encuentran seis especies y una variedad, incluyendo la descrita en este trabajo; su hábitat varía desde la Selva Lluviosa Neotropical Perennifolia, hasta la Selva Inferior al Bosque Subandino, entre los 100–2,000 m sobre el nivel del mar.

Metteniusa cogolloi G. Lozano-C., sp. nov. TIPO: Colombia. Antioquia: Peque, Parque Nacional Natural "Paramillo," vereda Antadó, alt. 1,500–1,600 m, 3 Mar. 1993 (fl, fr), *A. Cogollo, H. Cuadros & A. Gentry 6024* (holótipo, COL; isótipos, JAUM, MO). Figura 1.

Metteniusae huilensi affinis, sed petiolo, lamina, staminibus et stilo parvioribus; inflorescentiis lateralibus 10–12 floribus, dum alteri sunt inflorescentiae laterales 4–6 floribus.

Arbol 8–10 m alto; ramillas teretes con indumento tomentoso corto, color marrón, caduco, escasamente lenticeladas; lenticelas ovales, en las ramillas más viejas se observan líneas longitudinales muy apretadas. Entrenudos zigzagueantes de mayor longitud en la región de los renuevos (ca. 3.5 cm). Hojas alternas, pecioladas, pecíolos cortos, generalmente retorcidos recubiertos de indumento, 1.0–1.68 cm de longitud (M = 1.41, N = 10) × 0.20–0.28 cm de diámetro (M = 0.26, N = 10), adaxialmente canaliculado, abaxialmente convexo; lámina foliar oblonga u obovada, 13.5–18.5 cm de longitud (M = 15.9, N = 10) × 6.3–10 cm de anchura máxima (M = 7.5, N = 10), base redondeada, ápice cuspidado, cartácea, haz glabra, envés foliar en las hojas jóvenes completamente cubierto por tomento corto, adpreso, en las adultas pubérulas; nervios secundarios 9–12, prominentes por la haz, retículo promínulo por ambas caras. Inflorescencias cimosas, axilares, generalmente con 4 inflorescencias parciales (ramas) con un total de 10–12 flores, hasta 4.8 cm de longitud × 0.28 cm de diámetro basal del eje principal. Brácteas florales 4, ovadas, cocleariformes, cubiertas externamente por tomento leonado. Flores de color verdoso, 2.9 cm de longitud × 0.3 cm en diámetro; cáliz 0.40 cm de longitud, unido en ½ de su longitud, lóbulos 5 ovados con el ápice más o menos redondeado, borde ciliado; corola unida formando un tubo 0.6 cm longitud, continuándose por 5 lóbulos acintados, reflejos en la antesis, exteriormente tomentosos con pelos cortos adpresos, color leonado, interiormente lanosos, pelos largos rojizos. Estambres 5, epipétalos, dispuestos a 0.5 cm de la base de la corola, unidos a ésta en 0.2 cm de longitud y protegidos por mechones de indumento rojizo, filamentos 1.3 cm de longitud; anteras 0.8 cm de longitud, moliniformes, unidas apicalmente al filamento en 0.5 cm de su longitud, desprendidas basalmente en 0.3 cm dando la apariencia de sagitadas. Gineceo súpero, ovario elíptico

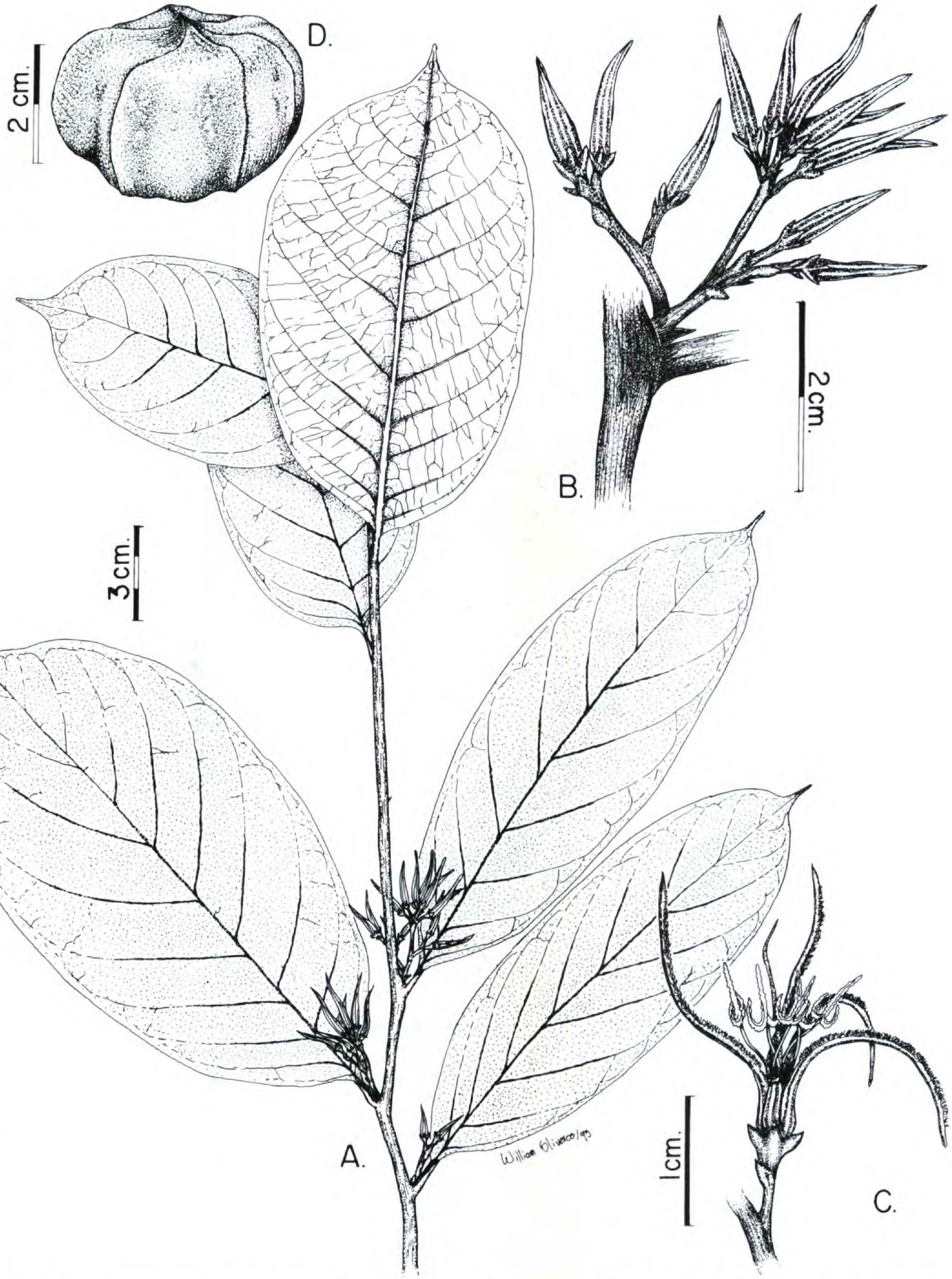

Figura 1. *Metteniusa cogolloi* G. Lozano C-. (*Cogollo et al. 6024*). —A. Ramilla florífera. —B. Detalle de la inflorescencia. —C. Detalle de la flor abierta. —D. Detalle del fruto en vista dorsal.

0.4 cm de longitud × 0.2 cm en diámetro, con seis fuertes (marcadas) costillas (Fig. 2g), tomentoso, estilo filiforme, 1.2 cm longitud, apicalmente truncado. Fruto inmaduro globoso, apiculado, glabro, 3.05 cm de longitud × 3.8 cm en diámetro, color verde, con seis costillas marcadas (Fig. 1D), angulosas, el cáliz persistente, no acrecente.

Metteniusa cogolloi se asemeja a *M. huilensis* en la forma de la lámina foliar, si bien es relativa-

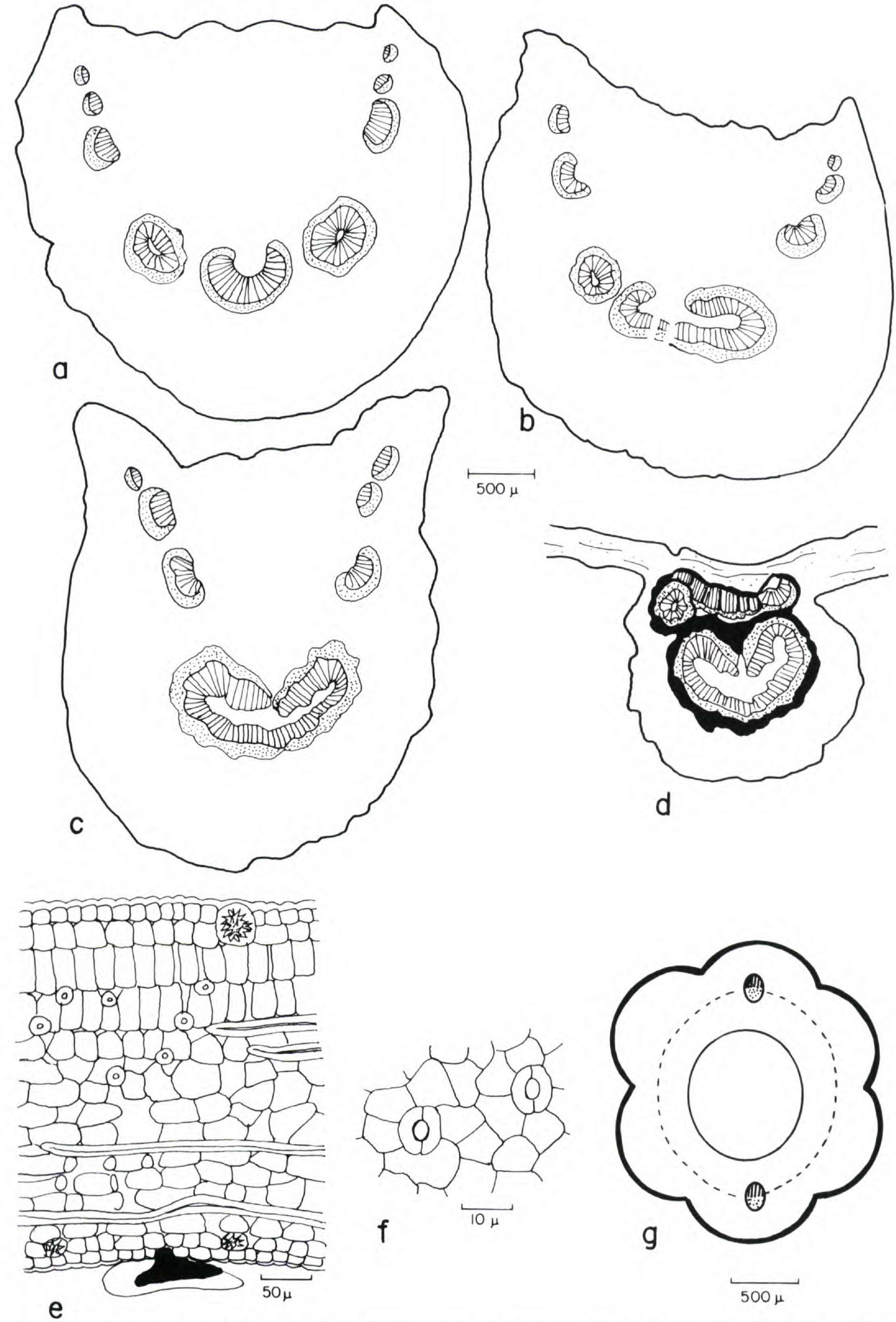

Figura 2. Corte transversal del pecíolo de *Metteniusa cogolloi* (*Cogollo et al. 6024*) mostrando las trazas vasculares. —a. Porción basal. —b. Porción media. —c. Porción apical. —d. Corte transversal de la lámina foliar, mostrando los tejidos vasculares a nivel del nervio medio. —e. Porción laminar. —f. Estoma. —g. Corte transversal del ovario. Rayado: xilema; punteado: floema; negro: esclerénquima.

mente de menor tamaño; difiere de esta especie en: las ramillas más gruesas; el peciolo corto y grueso; las hojas cubiertas por indumento adpreso color gamuza; el realce y coloración de la costa, nervios secundarios y retículo; el mayor número de flores por inflorescencia; el cáliz, el filamento y el pistilo más cortos; y la forma del fruto globoso versus fruto ovalado que tienen la mayoría de las especies en donde se conoce: *M. edulis*, *M. cundinamarcensis*, *M. nucifera*, y *M. santanderensis*.

Anatomia

Continuando con el estudio anatómico de las especies del género *Metteniusa* emprendido en el trabajo de Lozano & de Lozano (1988), incluimos una descripción de las características anatómicas de la hoja de esta nueva especie.

Pecíolo: Se estudiaron los niveles basal, medio y apical (Fig. 2a–c); en todos, la epidermis abaxial está constituida por células pequeñas con las paredes externas redondeadas, muy ricas en taninos, y con cutícula gruesas. El parénquima adaxial se dispone en filas radiales, sus paredes son gruesas y llevan abundantes drusas. El sistema conductor basal presenta nueve haces (Fig. 2a); los tres haces centrales se unen hacia la parte media (Fig. 2b) y constituyen en la porción apical un gran haz central (Fig. 2c) de manera que son observables sólo siete haces en el ápice, que se continúan en la nervadura central. La torcedura del pecíolo sólo se evidencia a nivel anatómico por la asimetría observable a nivel medio, especialmente en los tejidos vasculares. No existen casquetes de fibras de esclerénquima junto al floema, las capas cercanas a la epidermis abaxial son colenquimáticas y sólo algunas células llevan drusas, las células epidermales en esta zona son similares a las descritas, y los pelos presentes son pequeños y globulares.

Nervadura central (Fig. 2d): presenta una epidermis adaxial formada por células pequeñas alargadas radialmente, ricas en taninos y cubiertas por cutículas gruesas; el parénquima, cuyas primeras capas son semejantes a las del parénquima en empalizada, las capas restantes están interesadas por fibras que aparecen en sección transversal o longitudinal. El cilindro vascular está integrado por un gran haz, prolongación del haz central del pecíolo y por un conjunto de haces (7), relacionados con la nerviación secundaria de la lámina; su número decrece hacia el ápice. Un casquete de fibras con paredes muy gruesas rodea todos los haces. El parénquima circundante es rico en drusas y taninos; hacia el lado abaxial se continúa con colénquima subepidérmico. Las células de la epidermis adaxial son alargadas radialmente, papilosas, con las paredes gruesas, recubiertas con cutícula de grosor medio, y el indumento es abundante, predominando los pelos de tipo globular.

Lámina (Fig. 2e): Bifacial; la epidermis adaxial presenta células pequeñas, con paredes y cutícula gruesa; en esta especie se aprecia una hipodermis formada por células de mayor tamaño que las epidérmicas, con abundantes drusas; algunas drusas son de gran tamaño e interesan la epidermis (Fig. 2e). El parénquima de empalizada es biestratificado y se continúa con una capa de transición; en la segunda capa del parénquima en empalizada y en la zona de transición se encuentran fibras principalmente cortadas transversalmente. El parénquima esponjoso es muy irregular; tiene 10–12 capas de células y está atravesado por fibras, algunas de ellas ramificadas; el estrato subepidérmico es denso y lleva drusas. Las células de la epidermis abaxial son pequeñas y la cutícula es delgada; lleva tricomas del tipo icacináceo principalmente. Los estomas son ciclocíticos, con 5–6 células anexas (Fig. 2f).

Metteniusa cogolloi se asemeja a *M. tessmanniana* var. *fragrantissima* por la disposición de los haces en la nervadura central; sin embargo, se encuentran varios haces adaxiales pequeños, separados por hileras de fibras. La principal diferencia de la lámina de *M. cogolloi* con las especies estudiadas por Lozano & de Lozano (1988) radica en la presencia de hipodermis con drusas muy grandes que interesan la epidermis adaxial. Los estomas de *M. cogolloi* son también ciclocíticos, el número y características de las células anexas recuerda a *M. santanderensis*. La anatomía del pecíolo sigue el patrón general encontrado en el género; el número de haces conductores de la porción basal es igual al de *M. santanderensis* y *M. tessmanniana* var. *fragrantissima*, únicamente alterada por la torcedura manifiesta en la asimetría del nivel medio del pecíolo. Finalmente los tricomas de esta especie son principalmente de tipo globular e icacináceo, aunque a veces podemos encontrar algunos de tipo malpigiáceo (sensu Heintzelman & Howard, 1948).

Usos

Los usos para esta especie no se conocen; sin embargo, las especies de *Metteniusa* han sido utilizadas como alimento dentro de los aspectos culturales de los Chibchas y específicamente en los grupos U'wa (Tunebos y Kogi); según Osborn (1985), el primer grupo denomina a estas plantas como "kara" y los frutos son consumidos después de dejarlos en un arroyo para quitarle el sabor amargo; los Kogi, las llaman "kandji" (Reichel-Dolmatoff,

1985), y consumen los frutos, después de sacarles el sabor amargo cocinándolos en agua, durante las fiestas. Pittier (1925) anota para *M. nucifera*, los nombres "Macagua" y "Urupagua"; sus frutos también son consumidos después de cocinarlos; quizás esta costumbre pudo ser aprendida de un grupo U'wa que habita o habitaba esta región. Es llamativo el hecho de coincidir hasta hace poco la distribución del género con la distribución de este grupo chibcha hacia el oriente colombiano y aún una rama en Venezuela. Averiguaciones sobre el uso de plantas por grupos indígenas en la localidad de esta especie que se describe no dieron resultados fructíferos, ni en la consulta bibliográfica, ni con antropólogos dedicados actualmente a estos estudios.

Clave para las Especies de *Metteniusa*

1a. Flores mayores de 3.5 cm de longitud.
  2a. Hojas coriáceas; ovario glabro . . . *M. nucifera*
  2b. Hojas cartáceas; ovario pubescente.
    3a. Corola mayor de 5.0 cm; lamina foliar estrechamente obovada . . . . . *M. edulis*
    3b. Corolas entre 3.5–4.5 cm de longitud.
      4a. Hojas comúnmente elípticas, mayores de 25 cm de longitud, ápice atenuado . . . . *M. tessmanniana* var. *fragrantissima*
      4b. Hojas comúnmente ovadas u ovado-oblongas, menores de 24 cm de longitud, ápice abruptamente cuspidado . . . *M. tessmanniana* var. *tessmanniana*
1b. Flores menores de 3.5 cm de longitud.
  5a. Pecíolo suberificado, con estrías transversales; nervios secundarios 13–15 . . . . . *M. cundinamarcensis*
  5b. Pecíolo no suberifido ni estriado; nervios secundarios 9–12.
    6a. Lámina foliar mayor de 15 cm de longitud promedio × 7.5 cm de latitud promedio, papirácea o cartácea.
      7a. Pecíolo 1.0–1.7 cm de longitud, robusto; eje de la inflorescencia 4–5 cm de longitud, con 10–12 flores . . . . . *M. cogolloi*
      7b. Pecíolo 2.0–2.5 cm de longitud, delgado; eje de la inflorescencia 2.0–2.5 cm de longitud, con 4–6 flores . . . . . *M. huilensis*
    6b. Lámina foliar menor de 14 cm de longitud promedio × 6.0 cm de latitud promedio, coriácea . . *M. santanderensis*

Literatura Citada

Heintzelman, C. E. & R. A. Howard. 1948. The comparative morphology of the Icacinaceae V. The pubescence and Crystals. Amer. J. Bot. 35: 42–52.

Lozano-C., G. & N. Becerra de Lozano. 1988. Metteniusaceae. Pp. 11–53 *in* P. Pinto, & G. Lozano (editores), Flora de Colombia 11. Instituto de Ciencias Naturales-Museo de Historia Natural, Univ. Nacional de Colombia.

Osborn, A. 1985. El Vuelo de las Tijeretas. Fundación de Investigaciones Arqueológicas Nacionales, Banco de la República, Colombia.

Pittier, H. 1925. Arboles y Arbustos nuevos de Venezuela. Bol. Ci. Técn. Mus. Comercio Venez. 1: 45–47.

Reichel-Dolmatoff, G. 1985. Los Kogi. Procultura, Colombia.

A New Species, New Synonyms, and a New Combination in Brazilian Velloziaceae

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ABSTRACT. *Vellozia stenocarpa* Mello-Silva sp. nov. (Velloziaceae) is distinguished by very narrow fruits and quickly deciduous leaf blades. Morphoanatomic descriptions, illustrations, and comments on taxonomic relationships are presented. A new combination is made: *Barbacenia riparia* (N. L. Menezes & Mello-Silva) Mello-Silva. Three species are relegated to the synonymy of *B. markgrafii* Schulze-Menz, and the varieties of *Vellozia marcescens* L. B. Smith are merged. Distribution and morphological variation are discussed for each species.

A floristic study of the Velloziaceae of Grão-Mogol, Minas Gerais, Brazil (Mello-Silva, 1989) revealed the presence of 19 species, of which four were new to science. Three of these have already been described (Mello-Silva, 1991b; Mello-Silva & Menezes, 1988); the fourth is described in the present paper.

Vellozia stenocarpa Mello-Silva, sp. nov. TYPE: Brazil. Minas Gerais: Joaquim Felício, Serra do Cabral, descida da serra, campo rupestre, 17°42′S, 44°14′W, 1,000 m alt., 12 Feb. 1988 (fl, fr), *J. R. Pirani, W. W. Thomas, R. Mello-Silva & J. B. Fernandes 2217* (holotype, SPF; isotypes, K, MBM, NY, RB, UB). Figures 1–3.

Planta solitaria; caudice 8–120 cm longo. Folia trifaria; lamina mox caduca, 13–33 cm longa, 4–13 mm lata ad basim, lineari-triangulari, glabra, marginibus serrulatis, apice attenuato. Inflorescentia floribus singulis binis ternisve dispositis; pedunculo 6–15 cm longo, glabro vel apicem versus pauci-glanduloso. Flos hypanthio oblongo-trigono, 10–25 mm longo, 3–6 mm diam., glabro vel pauci-glanduloso praecipue ad angulas, ad ovarium pro ⅘ partibus longitudinis suae adnato; tepalis violaceis, ellipticis, erecto-patentibus, 2.5–5.5 cm longis, 0.7–2 cm latis, glabris; staminibus 30, appendicibus minutis, vix laceratis, filamentis ca. 3 mm longis, antheris ca. 7 mm longis; stylo 1.6–2.5 cm longo; stigmate trilobo-peltato, ca. 3–7 mm diam. Capsula 10–25 mm longa, 4–7 mm diam., parietibus lateralibus rumpentibus dehiscens; seminibus atro-castaneis.

Plant solitary; stem 8–120 cm tall. Leaves 9–12, spiro-tristichous, straight, erect-patent; leaf sheaths brown, brownish gray at apex, resinous; lamina 13–33 cm long, 4–13 mm broad, linear-triangular, attenuate, glabrous, soon deciduous, the margins serrate. Inflorescence with peduncles 1–3, 6–15 cm long, glabrous or with subsessile to sessile glands toward apex. Flower with hypanthium 10–25 mm long, 3–6 mm diam., oblong, trigonous, glabrous or with subsessile to sessile glands on angles and, rarely, between angles; ovary filling ⅘ of the hypanthium; tepals 2.5–5.5 cm long, 0.7–2 cm broad, erect-patent, elliptic, violet, glabrous; stamens 30, the appendages inconspicuous, toothed, the filaments ca. 3 mm long, arched at base, the anthers ca. 7 mm long; style 1.6–2.5 cm long; stigma 3–7 mm diam., trilobed. Capsule 10–25 mm long, 4–7 mm diam., obovoid-oblong to oblong, trigonous, dehiscent by rupture of the lateral walls; seeds foveate, deep brown.

Leaf anatomy (Hatschbach 42520, Cordeiro CFCR 4107, Pirani 2217). Blade dorsiventral. Furrows about ⅖ thickness of blade. Cuticle thickened on both surfaces. Adaxial epidermis uni-biseriate, abaxial epidermis uniseriate. Stomata mostly confined to furrows. Aquiferous uni-biseriate hypodermis present on both surfaces, extending adaxially to bundle sheaths and furrows as aquiferous parenchyma. Palisade mesophyll 3–4 cell layers thick, adaxially merging with lacunar mesophyll. Fibrovascular bundles surrounded by a distinct bundle sheath, 1–3 large vessels present in each fibrovascular bundle. Phloem strands 2, separated by fibers. Fibers extending as girders, adaxially to the aquiferous parenchyma and abaxially to the hypodermis. Bundles of subepidermal sclerified cells (1–)3 cells thick present beneath the adaxial surface and 1–2 cells thick beneath the abaxial surface or at the lower edges of the furrows.

Vellozia stenocarpa resembles *V. angustifolia* Goethart & Henrard in general aspect (although the former is more robust), in the shape and indumentum

Figure 1. *Vellozia stenocarpa* Mello-Silva. —A. Habit. —B. Leaf apex, adaxial surface. —C. Leaf margin. —D. Petal, with stamens at base. —E. Fruit with detail of glands. A, *Hatschbach 42920*. B, E, *Mello-Silva CFCR 9664*. C, D, *Simonis CFCR 4107*.

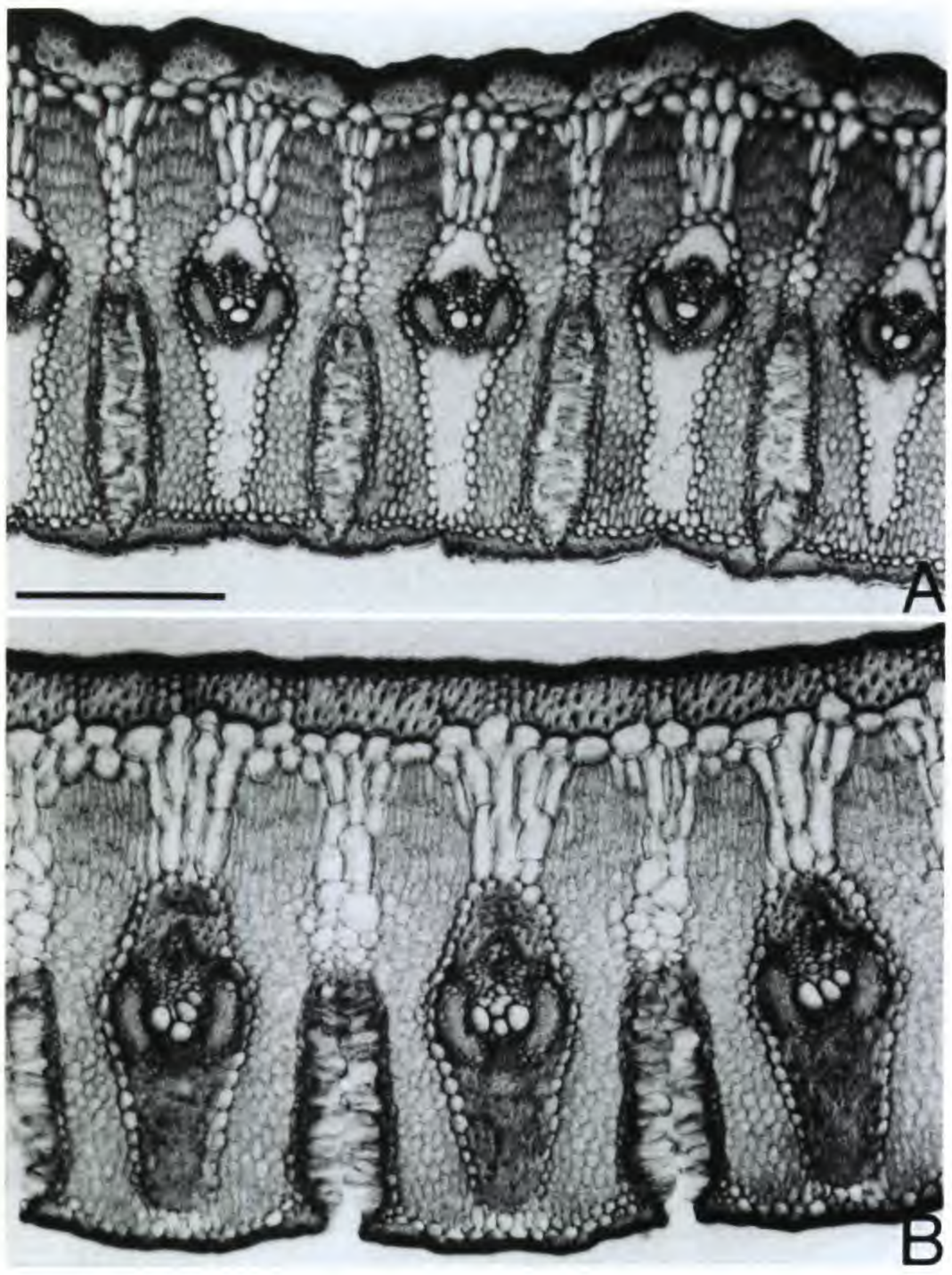

Figure 2. Cross section of median region of lamina of *Vellozia stenocarpa*. A, from *Hatschbach 42520*. B, from *Simonis CFCR 4107*. Scale bar = 0.2 mm.

of the hypanthium and fruit, and also in the structure of the leaf blade in transverse section. They differ chiefly in the number of stamens, 18 in *V. angustifolia* and 30 in *V. stenocarpa*, and in the leaves: marcescent, reflexed and resinous with a maximum width of about 3 mm in *V. angustifolia;* and deciduous, not reflexed, not resinous with a width of 4–13 mm in *V. stenocarpa*. The new species also resembles *V. compacta* Martius ex J. A. & J. H. Schultes in the soon deciduous leaves and in the hypanthium glandular on the angles. However, *V. compacta* reaches a height of up to 3 m and has much larger flowers with well-developed staminal appendages. In the leaves of *V. compacta* the fibrovascular bundles do not extend to the abaxial hypodermis, and the assemblage of the upper fibers in these bundles has the same dimensions as the lower one.

Vellozia stenocarpa occurs on the Espinhaço range in Minas Gerais, at Grão-Mogol and Serra do Cabral (Fig. 3). Individuals from Grão-Mogol are lower in stature (up to 60 cm tall), the hypanthium is glandular, and the tepals are smaller (up to 3 cm long). In the Serra do Cabral plants reach 1.2 m, the hypanthium may be completely glabrous, and the tepals are larger (up to 5.5 cm long). The leaves,

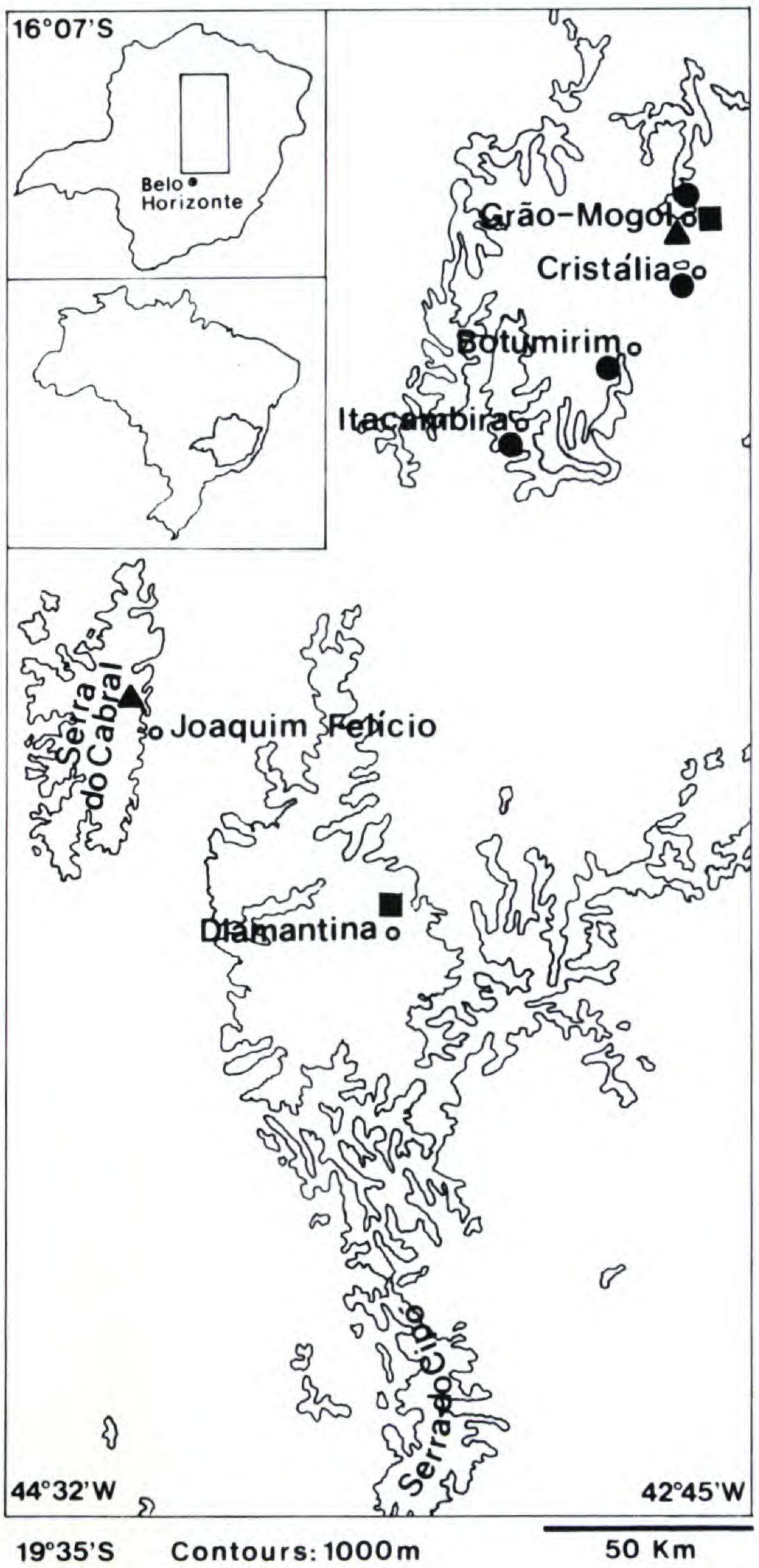

Figure 3. Portion of the Espinhaço range, north of Belo Horizonte in the state of Minas Gerais, Brazil, showing distribution of *Barbacenia markgrafii* (square), *Vellozia marcescens* (circle), and *V. stenocarpa* (triangle).

when they fall and dry, roll up and form cushions on the ground between the plants.

Paratypes. BRAZIL. **Minas Gerais:** Grão-Mogol, wet sandy campo with low outcrops, ca. 16 km W of Grão-Mogol, elev. 950 m, 17 Feb. 1969 (fr), *H. S. Irwin, R. Reis dos Santos, R. Souza & S. F. da Fonseca 23459* (HB, NY not seen, SP); arredores, 24 Mar. 1980 (fl, fr), *G. Hatschbach 42920* (MBM, NY not seen, SPF, US not seen), 27 Feb. 1983 (fl, fr), *E. Simonis & I. Cordeiro CFCR 4107* (SPF, U not seen); margens de córrego à saída da cidade na estrada para o rio Ventania, 900–1,000 m s.m., 25 Feb. 1986 (fr), *R. Mello-Silva, N. L. Menezes, T. B. Cavalcanti, J. Semir & N. S. Chukr CFCR 9664* (SPF); Joaquim Felício, estrada entre a ci-

dade e o Córrego da Areia, 22 Mar. 1994 (fl, fr), *P. T. Sano, V. C. Souza, R. M. Harley, C. M. Sakuragui & N. Roque CFCR 15383* (G, HUEFS, K, MO, SPF).

Barbacenia markgrafii Schulze-Menz in Markgraf, Notizbl. Bot. Gart. Berlin-Dahlem 15: 216. 1940. TYPE: Brazil. Minas Gerais: Grão-Mogol, rio Itacambirussu, sandiger, lichter Uferwald 700 m ü.M., 13 Nov. 1938 (fl), *Markgraf et al. 3519* (holotype, B not seen; isotype, RB). Figure 3.

Barbacenia albiflora L. B. Smith, Contr. U.S. Natl. Herb. 35: 292, pl. 12: figs. 69, 70. 1962. Syn. nov. TYPE: Brazil. Minas Gerais: Grão-Mogol, Serra Grão Mogol, N base of mountain, 600–700 m alt., 16 Aug. 1960 (fl), *Maguire et al. 49213* (holotype, US not seen; isotypes, NY not seen, R).

Barbacenia bibiriensis L. B. Smith & Ayensu, Smithsonian Contr. Bot. 30: 33, pl. 26, 37a, b. 1976. Syn. nov. TYPE: Brazil. Minas Gerais: Diamantina, Biri-biri, dos afloramentos rochosos, 11 Aug. 1972 (fl), *Hatschbach 30190* (holotype, US not seen; isotype, MBM).

Barbacenia sordida L. B. Smith & Ayensu, Smithsonian Contr. Bot. 30: 36, pl. 28, 37e, f. 1976. Syn. nov. TYPE: Brazil. Minas Gerais: sandstone precipices and adjacent cerrado, ca. 18 km W of Grão-Mogol, elev. 950 m, 21 Feb. 1969 (fl, fr), *Irwin et al. 23673* (holotype, US not seen; isotype, NY).

Distribution. Brazil. Minas Gerais: Grão-Mogol and Diamantina.

Smith & Ayensu (1976) separated the three species of *Barbacenia* Vandelli here treated on the basis of the length of the perigonial tube: equal to or less than the portion fused to the ovary in *B. markgrafii* and longer than this portion in *B. albiflora* and *B. sordida*. However, in the type of *B. markgrafii* the ovary is 1 cm long and the perigonial tube is 2 cm long, i.e., twice the length of the portion fused to the ovary. Therefore, the separation of *B. albiflora* and *B. sordida* from *B. markgrafii* on the basis of this character cannot be justified. The character used to distinguish *B. albiflora* from *B. sordida*, the length of the peduncle relative to the leaves, exhibits a wide range of variation. Some specimens have peduncles much shorter than the leaves, others have peduncles equaling or somewhat shorter than the leaves, while still others have peduncles somewhat to much longer than the leaves. A single population may include individuals with peduncles shorter than the leaves and others with peduncles longer than the leaves (*Menezes 1114, 1118; Mello-Silva CFCR 8338, 10072*). With respect to the characters here discussed the type specimens show no discontinuities relative to the other collections studied, indicating that they represent a single species.

Furthermore, in their key Smith & Ayensu (1976) distinguished *B. albiflora* (= *B. markgrafii*) from *B. bibiriensis* on the basis of flower color and the length of the hypanthium: white flowers with hypanthia 4 cm long in the former as oppposed to green flowers with hypanthia 5 cm long in the latter. These characters vary in *B. markgrafii:* the flowers are green externally, sometimes with purplish patches, and white internally; and the hypanthium varies in length from 3 to 5 cm. In addition, the taxa share leaf blades with glandular trichomes and ciliate margins, and peduncles with two types of glandular emergences. Thus *B. bibiriensis* is here treated as a southern population of *B. markgrafii.*

Additional specimens examined. BRAZIL. **Minas Gerais:** Grão-Mogol, *Mello-Silva & Cordeiro CFCR 10072* (F, K, MBM, SPF, RB, US), *Mello-Silva et al. CFCR 8338* (RB, SPF, US), *CFCR 8977, 9657* (SPF), *Menezes 408, 1114, 1118, 1121, 1123, 1125* (SPF); Diamantina, *Hatschbach & Zelma 49766* (MBM, SPF), *Mello-Silva et al. 410* (K, MBM, MO, NY, RB, SPF, UB, US).

Vellozia marcescens L. B. Smith, Contr. U.S. Natl. Herb. 35: 289. 1962. TYPE: Brazil. Minas Gerais: Grão-Mogol, slopes and summit of Serra Grão Mogol, 900–1,000 m, 17 Aug. 1960 (fl, fr), *Maguire et al. 49259* (holotype, US not seen; isotypes, K not seen, NY not seen, R). Figure 3.

Vellozia marcescens L. B. Smith var. *minor* L. B. Smith, Contr. U.S. Natl. Herb. 35: 289. 1962. Syn. nov. TYPE: Brazil. Minas Gerais: Grão-Mogol, N base of mountain, 600–700 m, 16 Aug. 1960 (fr), *Maguire et al. 49219* (holotype, US not seen; isotypes, NY not seen, R).

Distribution. Brazil. Minas Gerais: Grão-Mogol, Cristália, Botumirim, and Itacambira.

When he described *Vellozia marcescens*, Smith (1962) established two varieties: *V. marcescens* var. *marcescens* with a branched stem to 30 cm tall, leaves to 7 cm long × 7 mm wide and a peduncle 15–20 mm long; and *V. marcescens* var. *minor* with a simple stem to 20 cm tall, leaves 4.5 cm long × 3.5 mm wide and a peduncle to 35 mm long. Subsequently, Smith & Ayensu (1976) maintained the two varieties but withdrew stem length as a diagnostic character. This left the branching of the stem, or lack thereof, as the only true distinguishing character between the varieties. Several collections (*Maguire 49219; Mello-Silva CFCR 8456, 9111; Hatschbach 41349, 41638*) include both branched and unbranched specimens. Other collections (*Martinelli 5838, Menezes 402*) with branched stems have leaf lengths exceeding those

described for the typical variety and peduncle lengths corresponding to those of *V. marcescens* var. *minor*. Still other collections (*Ferreira 753*, *Irwin 23387*) include specimens with leaf lengths and widths corresponding to those of both varieties and peduncle lengths appropriate to *V. marcescens* var. *minor*. By virtue of its simple stems and peduncle length *Giulietti CFCR 3433* could belong to *V. marcescens* var. *minor*, but in its leaf measurements it seems closer to the typical variety. *Maguire 49259*, the type of *Vellozia marcescens*, is the only collection that matches the description of the typical variety well. This evidence renders the recognition of the varieties untenable.

Additional specimens examined. BRAZIL. **Minas Gerais:** Grão-Mogol, *Ferreira et al. 753* (RB), *Giulietti CFCR 3433* (SPF), *Hatschbach 41349* (MBM, SPF, US not seen), *Hatschbach & Kasper 41638* (MBM, US not seen), *Irwin et al. 23387* (NY not seen, RB, UB, US not seen), *Martinelli 5838* (RB, SPF), *Mello-Silva et al. CFCR 8456* (F, K, SPF), *CFCR 9111* (F, K, MBM, SPF), *Menezes 639*, *656*, *661* (SPF), *Menezes et al. 402* (F, K, MBM, RB, SPF, US), *1117* (BHCB, K, RB, SPF); Cristália, *Mello-Silva et al. 488* (SPF); Botumirim, *Mello-Silva et al. 504* (SPF), *654* (CTES, SPF); Itacambira, *Mello-Silva et al. CFCR 9111* (F, K, MBM, SPF), *Pirani et al. 2263* (NY, SPF, UB).

Barbacenia riparia (N. L. Menezes & Mello-Silva) Mello-Silva, comb. nov. Basionym: *Pleurostima riparia* N. L. Menezes & Mello-Silva, Acta Bot. Bras. 1 (Supl.): 196, figs. 1–10, 13–14. 1988. TYPE: Brazil. Minas Gerais: Grão-Mogol, *Mello-Silva et al. CFCR 8400* (holotype, SPF; isotypes, K, RB, SP, US).

Distribution. Brazil. Minas Gerais: Grão-Mogol.

Pleurostima Rafinesque was established by Menezes (1980b), who cited the following generic characters: anthers basifixed, auriculate; stigmatic region subapical; and fruits prominently ribbed with seeds liberated after disintegration of the ovary walls. In contrast, the remaining taxa of the Barbacenioideae sensu Menezes (1980a) have anthers dorsifixed, nonauriculate; stigmatic region apical; and fruits dehiscing in other ways. However, *Barbacenia minima* L. B. Smith & Ayensu, *B. regis* L. B. Smith, and *B. coronata* Ravenna ex L. B. Smith & Ayensu (Mello-Silva, 1991a), along with two recently discovered species from Bahia and Minas Gerais, exhibit characters of both *Barbacenia* and *Pleurostima*, rendering the circumscription of the latter artificial. Maintaining the broadly delimited *Barbacenia* sensu Smith & Ayensu (1976) avoids splitting the genus into probably polyphyletic taxa.

Additional specimens examined. BRAZIL. **Minas Gerais:** Grão-Mogol, *Hatschbach 41244* (MBM, US not seen), *Martinelli 5821* (RB, SPF), *Mello-Silva et al. CFCR 8874* (SPF), *Menezes et al. 1110* (BHCB, F, NY, P, R, SPF), *Pirani et al. CFCR 858* (MBM, SPF).

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Literature Cited

Mello-Silva, R. de. 1989. Velloziaceae de Grão-Mogol, Minas Gerais, Brasil. Dissertação de mestrado, Universidade de São Paulo.

———. 1991a. The infra-familial taxonomic circumscription of the Velloziaceae: A historical and critical analysis. Taxon 40: 45–51.

———. 1991b. A new species of *Vellozia* from the Espinhaço Range, Brazil, with some considerations on the section *Xerophytoides*. Kew Bull. 46: 321–326.

——— & N. L. de Menezes. 1988. Duas espécies novas de Velloziaceae de Minas Gerais. Acta Bot. Bras. 1 (Supl.): 195–207.

Menezes, N. L. de. 1980a. Evolution in Velloziaceae, with special reference to androecial characters. Pp. 117–139 *in* C. D. Brickell, D. F. Cutler & M. Gregory (editors), Petaloid Monocotyledons: Horticultural and Botanical Research. Academic Press, London.

———. 1980b. Re-establishment of genus *Pleurostima* Rafinesque (Velloziaceae). Revista Brasil. Bot. 3: 37–47.

Smith, L. B. 1962. A synopsis of the American Velloziaceae. Contr. U.S. Natl. Herb. 35: 251–292, pl. 1–12.

——— & E. S. Ayensu. 1976. A revision of American Velloziaceae. Smithsonian Contr. Bot. 30: i–viii + 1–172.

Cynanchum crassipedicellatum (Asclepiadaceae), a New and Unusual Succulent from Madagascar

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ABSTRACT. A new leafless succulent species from Madagascar, *Cynanchum crassipedicellatum*, is described. Compared with the 25 succulent *Cynanchum* species of Madagascar, the new species exhibits numerous derived characters. It probably represents the sister taxon to *C. descoingsii* Rauh.

The semiarid parts of southwestern Madagascar support a rich succulent flora. The Asclepiadaceae tribe Stapelieae, which comprise almost exclusively stem-succulent species, are represented by two genera, *Stapelianthus* Choux and *Ceropegia* L. The Asclepiadeae subtribe Cynanchinae, which are predominantly herbaceous, are represented by four to five genera with stem-succulent forms (depending on the genus concept applied) and a total of about 40 species.

In the Stapelieae (some species of *Ceropegia*) and in the Asclepiadeae subtribe Cynanchinae (e.g., *Karimbolea* Descoings) a warty and glaucous stem texture has evolved several times independently. Warty and glaucous stems characterize 9 of the 25 leafless, stem-succulent *Cynanchum* L. species of Madagascar (Liede, unpublished data). No correlation between the stem texture and plant habit could be found; warty, glaucous species are represented among twiners, creepers, and self-sustaining subshrubs. The new species possesses the putatively derived habit of a subshrub, combined with an extremely specialized floral structure.

Cynanchum crassipedicellatum is clearly distinct from all other known *Cynanchum* species by its persistent, succulent pedicels. These persistent pedicels allow quick and easy recognition of this species both in vegetative (postfloral) stage and in flower. However, the succulence of the pedicels obscures the basic inflorescence structure (Fig. 1A). Careful examination reveals that the inflorescence structure in *C. crassipedicellatum* is not different from the one encountered commonly in the Asclepiadoideae. A terminal shortshoot is displaced into a lateral position by the elongation of an axillary branch, which continues the shoot system in a sympodial manner. The arrangement of the pedicels is helicoid, so that a bostrychoid inflorescence results; however, the rachis internodes are extremely short, so the inflorescence approaches an umbelliform structure. *Cynanchum crassipedicellatum* is certainly an extraordinary, though rare, taxon. Apart from the type collection, only one specimen, *Decary 10917*, collected in 1932, is known. Many well-delimited Malagasy species are extremely localized and rare, and some, e.g., *C. tsaratanaranense* Choux and *C. rossii* Rauh, are known only from the type collections.

Cynanchum crassipedicellatum Meve & Liede, sp. nov. TYPE: Madagascar. Toliara–Tôlanaro: 25°12′S, 47°17′E, ca. 20 km SE of Amboasary, 1969, *Hardy 2852* (holotype, K; isotype, MSUN). Figure 1.

Cynancho descoingsii Rauh affinis, sed differt pedicellis fortibus crassis (3–5 mm diam.) et longis (10–20 mm), persistentibus, floribus pusillis (5–7 mm diam.), corona apice staminali conica, carpellis et receptaculo centrali pilosis.

Plants subshrubs with subterranean organs consisting only of fibrous roots. Stems nontwining, erect to divergent, usually branching basitonically, perennial, succulent, warty, prominently glaucous, sparsely covered with appressed trichomes 600–800 μm long; the nodes thickened, the internodes 12–40 mm long, 4–8 mm diam.; latex white. *Leaves* reduced to scales, caducous, sessile, papery, 1.1–1.2 mm long, 0.4–0.6 mm wide, ovate, with 4 adaxial colleters. *Inflorescences* bostrychoid, always one per node, extra-axillary, subsessile, producing flowers over a period of several years, partial inflorescences

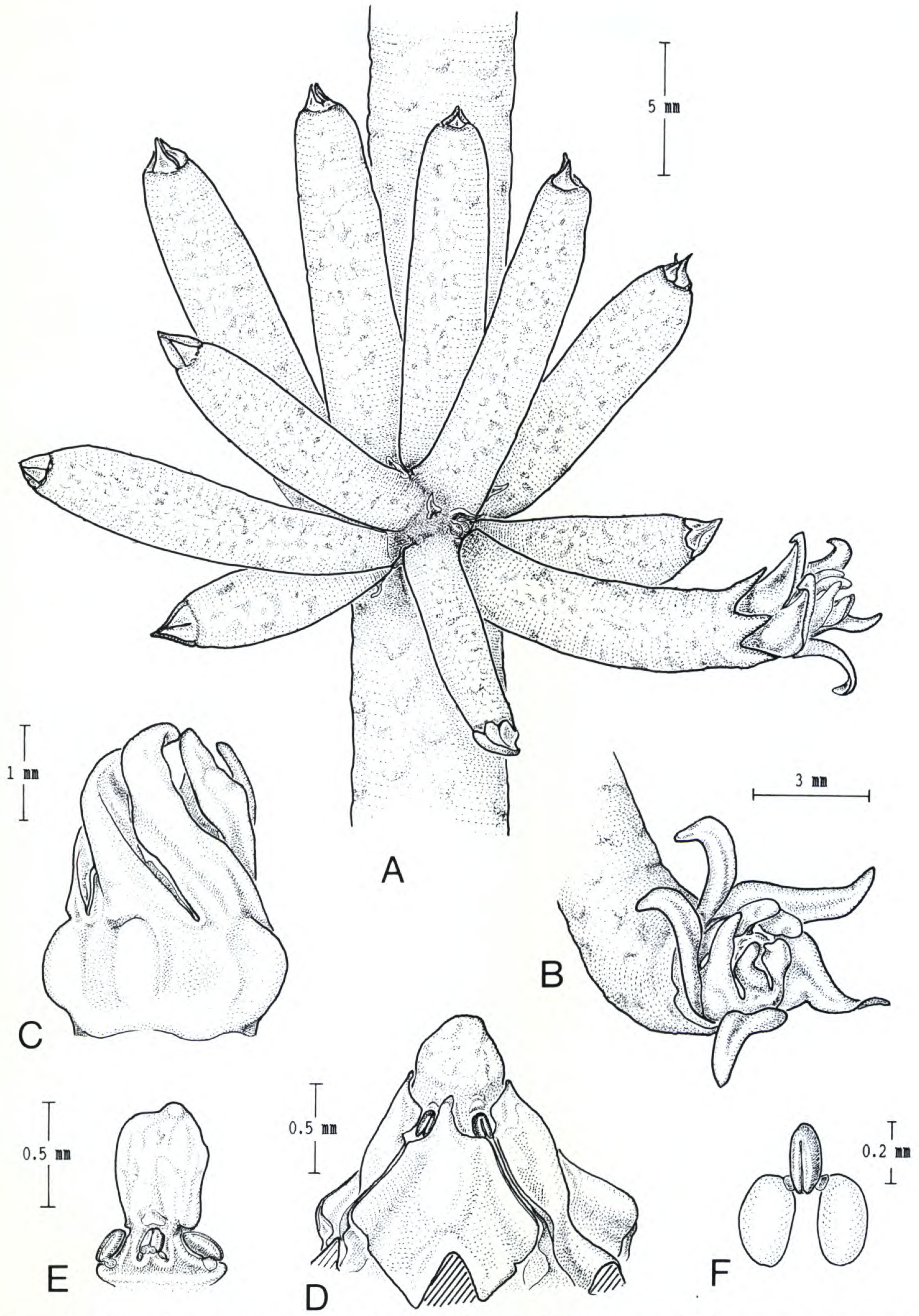

Figure 1. *Cynanchum crassipedicellatum* Meve & Liede. —A. Inflorescence with buds, one open flower, and postfloral pedicels. —B. Flower in top view. —C. Corona. —D. Gynostegium. —E. Stylar head with corpusculi (pollinia removed). —F. Pollinarium. Drawn by the senior author.

geminiflorous, (1)3–15-flowered, 1–2 flowers open at the same time. *Flowers* not nectariferous; floral bracts 1–1.2 mm long, 0.9–1 mm wide at the base, triangular, apically glandular, glabrous. *Pedicels* 10–12 mm long, ca. 3 mm thick, persistent, increasing in size with age to 20 mm long and 5 mm thick), slightly warty, glaucous, sparsely covered with flexuous trichomes, 400–500 μm long. *Floral buds* 3–4 mm long, 2.5–3 mm wide, conical, the aestivation contorted. *Calyx* fused ca. ¼ of its length, glabrous, the lobes 1.2–1.4 mm long, 0.9–1 mm wide, reddish gray, triangular, apically acute. *Corolla* elongated-conical, 2.5–3.5 mm long, 1.2–1.7 mm wide at the base, abaxially and adaxially purple, the lobes basally fused, triangular, twisted, the apices acute, recurved, the margins slightly recurved. *Gynostegial corona* conical, 2.4–3.2 mm high, exceeding the gynostegium and entirely obscuring it, basally purplish red, apically ivory, consisting of only basally fused staminal and interstaminal parts. Staminal parts differentiated, connate to the filament; lobes laminar, twisted, oblong, erect, apically conical and abaxially papillose, slightly inflexed. *Gynostegium* sessile, 1.6–1.8 mm high, 1.6–1.8 mm diam. *Stamens* with the column 0.25 mm long, the anthers ca. as long as broad, trapezoidal, abaxially planar, the anther wings 500–550 μm long, parallel to one another, extending along the whole length of the anther, slightly contorted, forming a distinct "mouth" with the basal lateral margin of the anther, the connective appendages triangular, narrower than the anthers, slightly inflexed. *Pollinarium* with the corpusculum 230–250 μm long, ovoid, dark brown, the caudicles ca. 50 μm diam., flattened, straight, horizontal, trapezoid-discoid, the pollinia subapically attached to the caudicles, ca. 300 μm long, 180–200 μm wide, yellow, ovate, elliptic in cross section. *Stylar head* 700–900 μm high, 500–600 μm diam., upper part 600–650 μm high, much higher than lower part, capitate, greenish. *Receptacle* with central dense brush of translucent trichomes, 500–1,200 μm long, basally filling the cleft between the carpels. *Carpels* obtusely triangular, 1.4–1.6 mm long, 1.5–1.8 mm diam. at the base, kidney-shaped in cross section, with adaxial sides flattened, adaxially sparsely, abaxially and along the margins more densely covered with whitish translucent, irregularly bent trichomes, 100–1,000 μm long, filling intragynostegial cavities. *Fruits* and *seeds* unknown. *Chromosome number:* $2n = 22$ (voucher: *Hardy 2852*).

Ecology. In dense bush on calcrete soil, with a few *Pachypodium lamerei* Drake and *Stapelianthus madagascariensis* (Choux) Choux.

Flowering time. September.

Distribution. Toliara–Tôlanaro; vicinity of Amboasary.

The name of this new species refers to its unique persistent, succulent pedicels.

Cynanchum crassipedicellatum represents the sister taxon to *C. descoingsii* Rauh. The two taxa are probably most closely related to a group of Malagasy endemic taxa, *C. antandroy* Descoings, *C. macrolobum* Jumelle & Perrottet, *C. rauhianum* Descoings, and *C. rossii* Rauh. *Cynanchum crassipedicellatum*, *C. descoingsii*, *C. antandroy*, and *C. rossii* are each known from a single locality in the arid southwest of Madagascar. *Cynanchum macrolobum* and *C. rauhianum* are slightly more widely distributed, occurring at several sites in the Isalo mountains.

Cynanchum descoingsii, only recently described by Rauh (1993), exhibits a very similar growth form and shoot texture to *C. crassipedicellatum*. However, *C. descoingsii* grows almost straight, while *C. crassipedicellatum* branches in a characteristically divaricate manner. Both species share a twisted corolla and corona lobes. Whereas twisted corolla lobes occur in various species of the genus, the twisted, fleshy, papillose corona lobes represent a unique synapomorphy.

As might be expected for two closely related, sympatric species, *Cynanchum descoingsii* and *Cynanchum crassipedicellatum* have developed significantly different floral biology strategies. The flowers of *C. descoingsii* are among the largest known in succulent *Cynanchum*, while those of *C. crassipedicellatum* are among the smallest. In general floral morphology the two species are quite similar, with the exception of the more slender corona-lobes with conical apices and the hairy carpels and receptacle of *C. crassipedicellatum*. In contrast, flower presentation is very different. *Cynanchum descoingsii* opens several flowers at the same time, these arranged on a true peduncle. The flowers of *C. crassipedicellatum*, in contrast, are usually single during anthesis and characteristically long-stalked. These long pedicels reach almost the same degree of succulence as the stem. They are persistent long after the flower has been shed and adopt a photosynthetic function.

Paratypes. MADAGASCAR. **Toliara–Tôlanaro:** Amboasaritelo, 9 Sep. 1932, *Decary 10917* (P).

Acknowledgments. For the donation of the type collection we owe thanks to Dave Hardy, Pretoria. The support of Heike Schoppmann (Münster) in preparing micro-sections of *C. crassipedicellatum*

flowers, and Peter Deitelhoff (Münster) in improving the Latin diagnosis is gratefully acknowledged. We thank Focke Albers (Münster) for his generous support of our studies.

Literature Cited

Rauh, W. 1993. Neue Asclepiadaceen aus Madagaskar. Trop. Subtrop. Pflanzenwelt 85: 7–41.

A New Species of *Bulnesia* (Zygophyllaceae) from the Xerothermic Southern Puna of Bolivia

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ABSTRACT. *Bulnesia rivas-martinezii* from southern inter-Andean Bolivia is described. Illustrations and ecological data for the new species are provided, as is a key to the three most closely related species of *Bulnesia* subg. *Bulnesia*.

The genus *Bulnesia* was recently revised by Palacios & Hunziker (1984), who recognized eight species. During a geobotanical survey of southern Andean Bolivia, a shrubby microphyllous *Bulnesia* was collected in late 1992 and is described here; the plant represents a geographically isolated taxon related to both *Bulnesia schickendantzii* Hieronymus and *B. foliosa* Grisebach. These relationships provide additional evidence about the origins and phytogeographical connections between the floras of Gran Chaco, the Monte, and the xerothermic Puna (Prepuna).

The new species is named for Salvador Rivas-Martínez, leader of Spanish botanists and a pioneer of geobotanical research in the Andes.

Bulnesia rivas-martinezii G. Navarro, sp. nov. TYPE: Bolivia. Chuquisaca: Provincia Sud Cinti, entre Villa Abecia y Camargo, a 1 km de Saladillo, 2,420 m, en bosque bajo y abierto de *Acacia feddeana* Harms, 28 dic. 1992, *G. Navarro 1913* (holotype, LPB; isotypes, BOLV, MAF, MO). Figures 1, 2.

Frutex lignosis 0.5–1.5 m altis. Folia (2.5–)5–8(–10) mm longis et 4–8 mm latis; foliolii (2–)4–6(–8), adpressis pubescentibus oblongo-ovati et mucronulati, (1.5–)3–6(–8) mm longis et (1.5–)2–3(–3.5) mm latis; flores solitarii, axillares, petala alba vel albescentia; squama staminalis apicibus laciniatoribus, externa duplicata et marginibus connatis, interna simplex; ovarium oblongum-fusiforme 5-angulatis dense adpressis-pubescentibus, pilis albis-sericeis; fructus oblongus-fusiformis vel oblongus-ellipticus, 5-alatis, 17–22(–25) mm longis et 5–7(–8) mm latis, adpressis-pubescentibus, pilis albis-sericeis.

Shrub, 0.5–1.5 m tall, branches (Fig. 1A) terete and covered with longitudinally fissured bark. Internodes (Fig. 1B) 3–10 mm long, 0.6–5 mm wide. Leaves (Fig. 1C, 2A) (2.5–)5–8(–10) mm long, 4–8 mm wide; leaflets (2–)4–6(–8), alternate, (1.5–)3–6(–8) mm long, (1.5–)2–3(–3.5) mm wide, oblong to ovate, basally asymmetric and scarcely mucronate, appressed-hairy on both surfaces; petiole 0.5–1.5 mm long with appressed pubescence; rachis 2–7 mm long, shortly mucronate and appressed-hairy. Stipules (Fig. 1B) caducous, 1–1.5 mm long, ovate-acute and reddish. Flowers (Fig. 1D, E) axillar and solitary; pedicels 5–8 mm long, villous-tomentose. Sepals 5–7 mm long, 2.5–4 mm wide, unequal (2/2/1) and puberulent with scarious margins. Petals 7–9 mm long, 2.5–3.5 mm wide, white or whitish, obovate-spathulate and clawed, shortly mucronate. Stamens 7–11 mm long; filaments 5–7 mm long, united at the base or free; anthers ca. 2–2.2 mm long, yellowish to violaceous; staminal scales (Fig. 2B, C, D), 3–4 mm long, 2 mm wide, inner simple, outer with two blades marginally connate into a short tube and with several basal violaceous filaments equaling or longer than the scale; both deeply laciniate apically, with numerous lacinia 1.5–2 mm long, 0.1–0.2 mm wide. Ovary (Fig. 2E) ca. 3 mm long, 1.5–1.7 mm wide, 5-angled, oblong-fusiform, densely appressed pubescent with hairs (Fig. 2F, G) white-sericeous, 0.1–0.4 mm long; 5 locules with 4–6(–8) pendulous-biseriate ovules. Style ca. 2.5 mm long, subulate, glabrous. Carpophore ca. 1 mm long. Fruit (Fig. 1B, F, g) 17–22(–25) mm long, 5–7(–8) mm wide, oblong-elliptic, 5-winged and ± appressed-hairy with whitish hairs 0.1–0.4 mm long. Seed (Fig. 1h) oblong, 4–5(–6) mm long, 1.5–2(–2.3) mm wide. Pollen grain (Fig. 2H, I, J) radially symmetrical, isopolar, prolate (polar axis (P) = 12.83 μm (11.75–14.1), standard deviation (S) = 0.62; equatorial diameter (E) = 10.98 μm (9.1–12.24), S = 0.71; P/E = 1.17), elliptical in meridional view (Fig. 2H) and 3-lobate, subcircular in polar view (Fig. 2I); 3-zonocolporate (Fig. 2H, I), ectoaperture type colpus, endoaperture irregular pore; exine tectate and reticulate; tectum complete on the colpus margins; infratectum columellate.

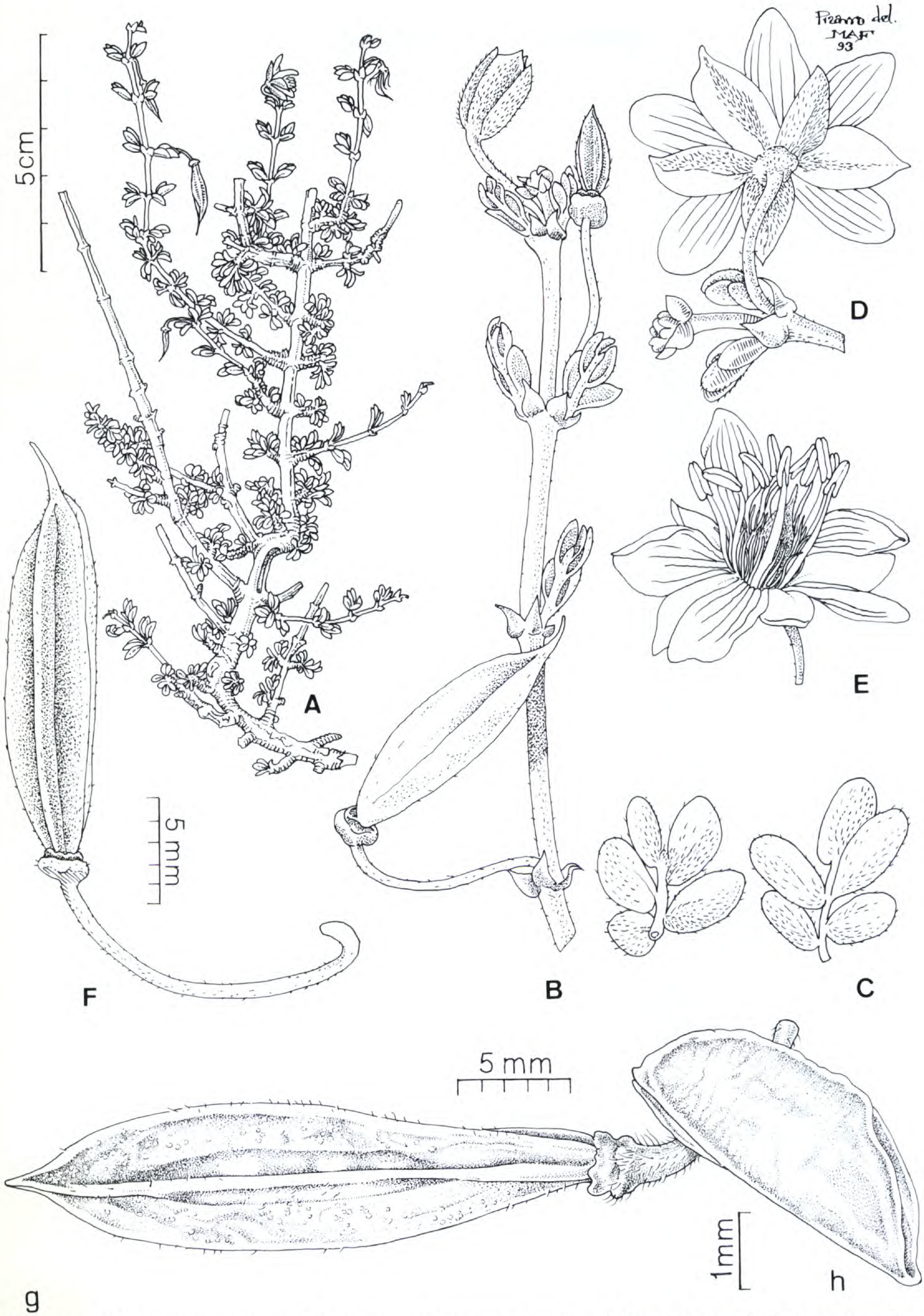
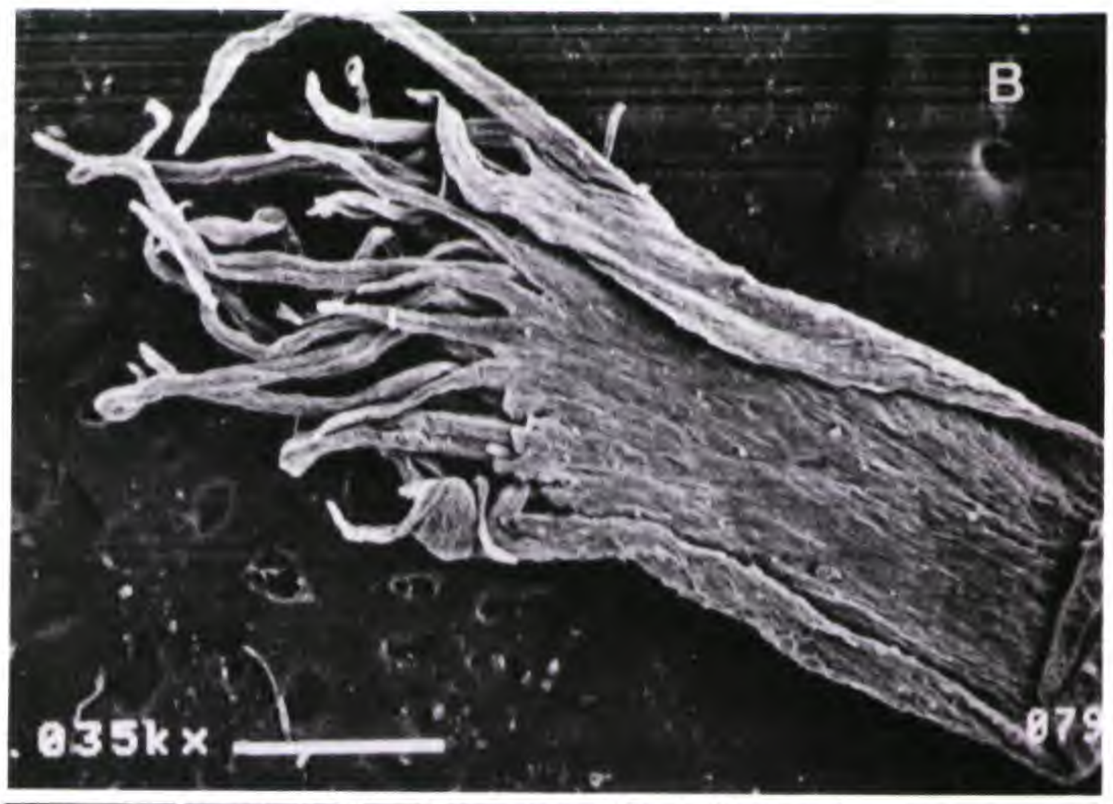
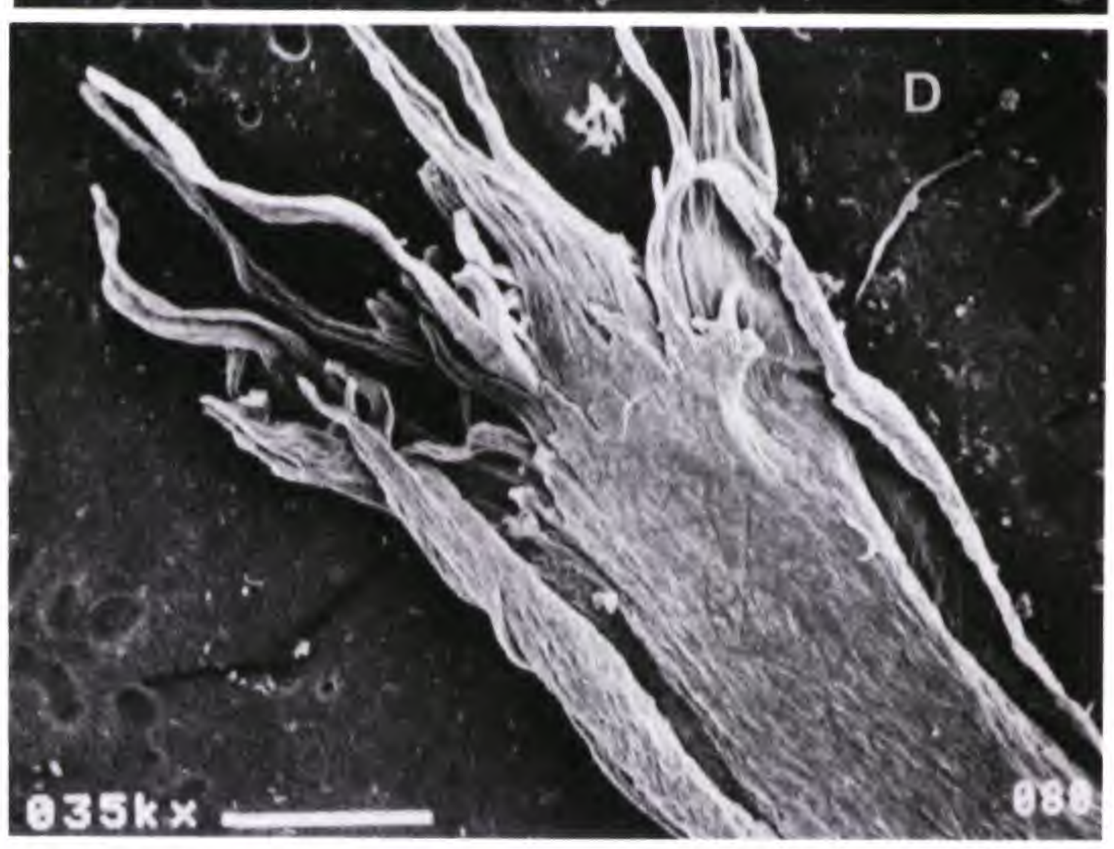
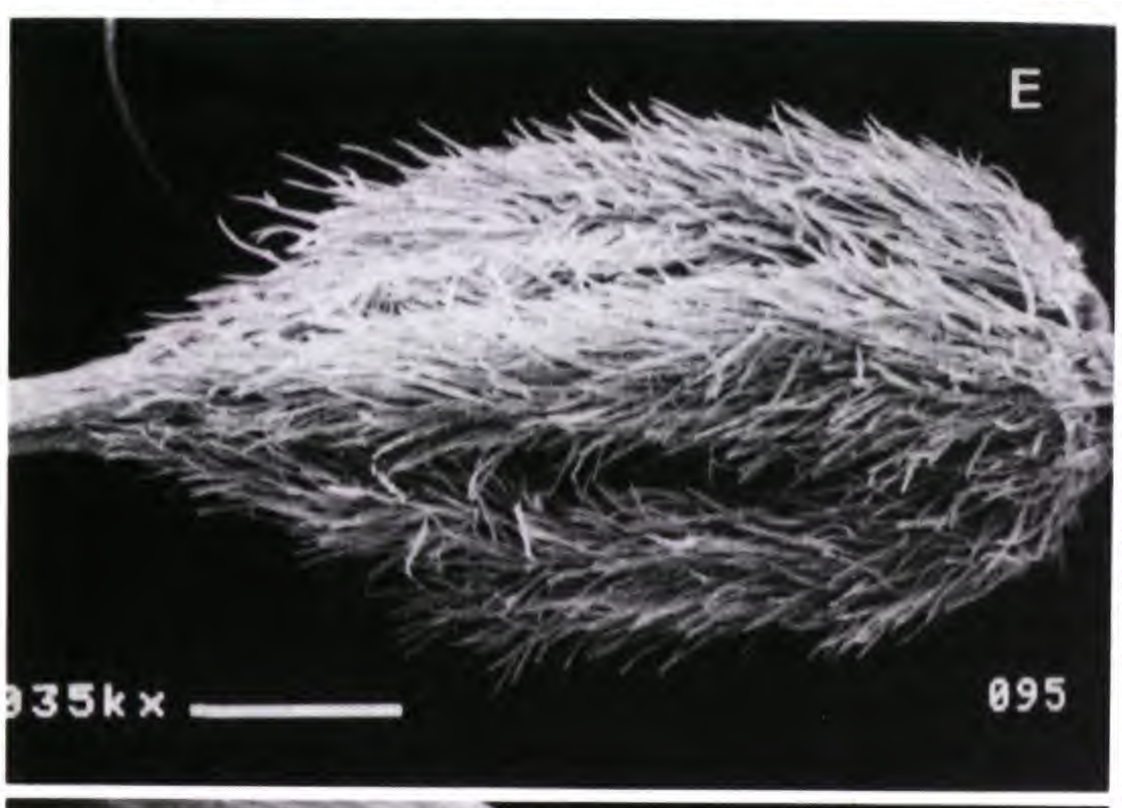


Figure 1. *Bulnesia rivas-martinezii* G. Navarro. —A. Flowering branch. —B. Detail of a branch, showing internodes, stipules, bud, and immature fruits. —C. Larger leaves with five leaflets. —D. Sepals and pedicel. —E. Flower. —F. Submature fruit. —g. Mature fruit. —h. Seed. Drawings A–F, from *G. Navarro 1913*. Drawings g and h, from *G. Torrico & C. Peca 321*.







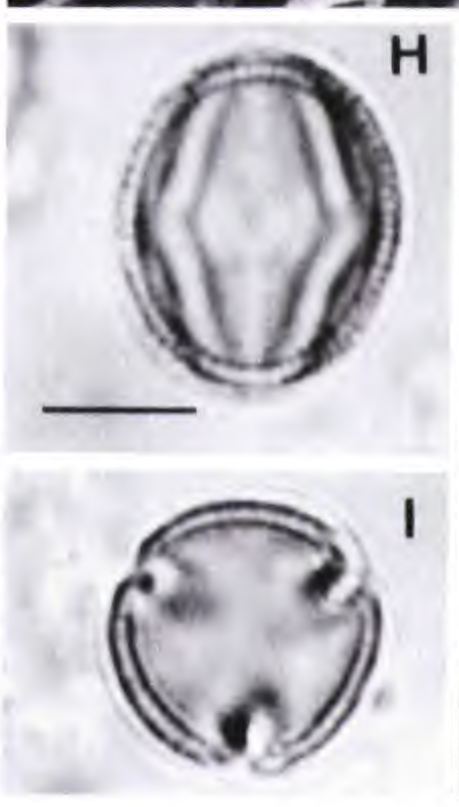


Figure 2. *Bulnesia rivas-martinezii* G. Navarro. —A. Leaves with two and four leaflets. —B, C, D. Staminal scales showing the lacinias. —E. Ovary. —F. Detail of ovary pubescence. —G. Detail of an ovary hair. —H. Optical meridional view of pollen grain. —I. Optical polar view of pollen grain. —J. Pollen in the style. (A, photomicrograph;

Vernacular name. "Chukupi" (Spanish transcription from Quechua language of Chuquisaca).

Paratypes. BOLIVIA. **Depto. Chuquisaca:** Prov. Sud Cinti/grenze Nord Cinti, Tajsara-Kette, W-Exp., Neigung 15°, 3,150 m, *Gerold 35* (LPB photocopy). **Depto. Potosí:** Prov. J. M. Linares Lizarazu, valle de Oronkhota, 2,810 m, *G. Torrico & C. Peca 321* (LPB).

Bulnesia rivas-martinezii is a distinctive microphyllous species that differs from *Bulnesia foliosa* by its smaller leaves, the white pilosity of the ovary and fruit, deeply laciniate staminal scales, and white or whitish flowers. *Bulnesia schickendantzii* differs from *Bulnesia rivas-martinezii* by its larger leaves, size and form of leaflets, glabrous ovary and fruit, and yellow flowers. *Bulnesia rivas-martinezii* differs from both *Bulnesia chilensis* Gay and *Bulnesia retama* (Gillies ex Hooker & Arnott) Grisebach by the absence of a whitish waxy layer covering the twigs; by its nonretamoid habit; and by the retention of the leaves after anthesis. *Bulnesia retama* has a glabrous ovary and *Bulnesia chilensis* has more leaflets and differently shaped mature fruits.

Based on literature (Descole et al., 1940, 1943; Crisci et al., 1979; Palacios & Hunziker, 1984), revision of *Bulnesia* material in LIL, and field observations in Bolivia (Chuquisaca) and Argentina (Tucumán and Salta), the distinction between *Bulnesia rivas-martinezii* and its closely related species is outlined in the following key:

1a. Leaflets 5–30 mm wide; outer staminal scales scarcely or not laciniate; ovary and fruit with yellowish reddish hairs; Argentina, Bolivia, and Paraguay (western Gran Chaco Boreal) . . . . . *Bulnesia foliosa* Grisebach

1b. Leaflets 1–5 mm wide; outer staminal scales deeply laciniate; ovary and fruit glabrous or with white-sericeous pubescence.

2a. Leaves 10–50 mm long and 50 mm wide, with (6–)8–10(–18) leaflets; leaflets 3–14 mm long and 1–5 mm wide; flowers yellow; ovary and fruit glabrous; mature fruit 8–15 mm long and 9–16 mm wide; northwestern Argentina (Monte & Prepuna) . . . . . *Bulnesia schickendantzii* Hieronymus

2b. Leaves (2.5–)5–8(–10) mm long and 4–8 mm wide, with (2–)4–6(–8) leaflets; leaflets (1.5–)3–6(–8) mm long and (1.5–)2–3(–3.5) mm wide; flowers white or whitish; ovary densely pubescent with appressed white-sericeous hairs; fruit with appressed white pubescence; mature fruit 17–22(–25) mm long and 5–7(–8) mm wide; southern Bolivia (inter-Andean xerothermic Puna or Prepuna) . . . . . *Bulnesia rivas-martinezii* G. Navarro

Ecology and Status

At present, *Bulnesia rivas-martinezii* seems to be restricted to the very dry inter-Andean valleys between Villa Abecia and Camargo (Nord Cinti and Sud Cinti provinces of Depto. Chuquisaca) and in the Oronkhota valley (Pilcomayo basin, Linares province of Depto. Potosí); apparently it is absent in the high basin of San Juan del Oro river between Tojo and Tupiza (Potosí). It occupies basal slopes (slope angle 15°–25°) facing west, on monoclinal quartzitic ranges of the Cordillera de Tajsara (Chuquisaca department) between ca. 2,300 and 2,600 (to 3,150) m altitude. In this country (average annual temperature 18.5°C; annual rainfall ca. 290 mm), it is locally frequent in clear xerophytic low forest or shrubland largely dominated by the southern Bolivian endemic *Acacia feddeana* Harms (xerothermic Puna or "Prepuna" of Cabrera & Willink, 1973); other frequently associated species are: *Gochnatia cardenasii* S. F. Blake, *G. glutinosa* D. Don, *Hyaloseris camataquiensis* Hieronymus, *Opuntia spinibarbis* F. Ritter, *Weingartia cintiensis* Cárdenas, *Senna crassiramea* (Bentham) Irwin & Barneby, *Bougainvillea spinosa* (Cavanilles) Heimerl, *Cercidium praecox* (Ruiz & Pavón) Harms, *Larrea divaricata* Cavanilles, and *Capparis atamisquea* Kuntze.

Acknowledgments. I thank Stephan Beck, of the Herbario Nacional de Bolivia (LPB), for the remittance of additional specimens examined. Cristina Pardo and Paloma Cubas, of the Departamento Biología Vegetal II, Universidad Complutense, are thanked for the photomicrographs; the former also prepared the pollen grain description. The illustration was prepared by José Pizarro of the same department. The Latin diagnosis was revised by María J. Tejero of Seminario de Latín, I. B. Brianda de Mendoza, Guadalajara.

Literature Cited

Cabrera, A. L. & A. Willink. 1973. Biogeografía de América Latina. Organización de los Estados Americanos, ser. Biología. Monografía 13. Washington, D.C.

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H and I, LM-photomicrographs; B, C, D, E, F, G, and J, SEM-photomicrographs; A, scale bar = 5 mm; B, D, and E, scale bar = 0.57 mm; C, scale bar = 0.60 mm; F, scale bar = 0.1 mm; G, scale bar = 4 μm; H and I, scale bar = 0.01 mm; J, scale bar = 13.24 μm.)

Crisci, J. V., J. H. Hunziker, R. A. Palacios & C. A. Naranjo. 1979. A numerical taxonomic study of the genus *Bulnesia* (Zygophyllaceae): Cluster analysis, ordination and simulation of evolutionary trees. Amer. J. Bot. 66(2): 133–140.

Descole, H. R., C. A. O'Donell & A. Lourteig. 1940. Revisión de las Zigofiláceas argentinas. Lilloa 5(2): 257–352.

———, ——— & ———. 1943. Zygophyllaceae. Pp. 3–46 *in* H. R. Descole, Genera et Species Plantarum Argentinarum 1. *Bonariae*. Sociedad A. Impresiones Generales, Buenos Aires.

Palacios, R. A. & J. H. Hunziker. 1984. Revisión taxonómica del género *Bulnesia* (Zygophyllaceae). Darwiniana 25(1–4): 299–320.

A New Species of *Solanum* sect. *Micracantha* (Solanaceae) from Venezuela

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ABSTRACT. While preparing the genus *Solanum* for the *Flora of the Venezuelan Guayana*, W. G. D'Arcy and I discovered *Solanum nuricum* M. Nee, sp. nov., among collections made in the northeastern part of the region.

Solanum nuricum M. Nee, sp. nov. TYPE: Venezuela. Bolívar: Altiplanicie de Nuria, vicinity of Deborah, summit of SE-facing escarpment, E of Cerro El Picacho, N of Las Nieves and Las Chicharras, 45 km N of Tumeremo, 600–650 m, 5–8 Feb. 1961 (fl, fr), *J. A. Steyermark 89242* (holotype, NY; isotypes, F, MO).

Liana lignosa alte scandens, ferruginea-tomentosa, aculeis uncinatis recurvis armata. Folia alterna, obovata, nonnunquam elliptica, 7–14 cm longa, 2.5–6 cm lata, subtus ad nervum aculeis parvis recurvis obsita. Inflorescentia simplex, racemosa, cymosa, ca. 10-floribus, terminalis dein recta lateralisque. Corolla caesia, stellata, lobis lanceolatis 15 mm longis, 6 mm latis. Antherae attenuatae, 11 mm longae. Ovarium tomentosum. Fructus globosus, tomentosus, 15 mm diametro.

High-climbing woody *liana* or sometimes apparently merely shrubby; twigs woody, terete, to at least 9 mm diam. and probably much larger, with prominent raised cordate leaf scars, the bark brown, smooth, lenticellate, with sessile and short-stalked ferruginous porrect stellate hairs, the rays 5–6, ca. 1 mm wide, the stalk to 0.5 mm long, the midpoint 0.5–1(–2) mm long, armed with recurved prickles 1–5 mm long, the enlarged, compressed base to 5 mm long. *Leaves* alternate, obovate or sometimes elliptic; blade (6–)7–14 cm long, 2.5–6 cm wide, acute to rounded at unequal base, acute to acuminate at tip, the margin entire or obscurely repand, not revolute, somewhat glossy and dark green above, paler below, sparsely tomentose above with sessile porrect stellate hairs, or some on midrib and major veins short-stalked, the rays 3–5, often very short, nearly obsolete, the midpoint 0.5–1.0 mm long, below with coarser sessile and short-stalked porrect stellae, the sessile ones mostly with 4 rays ca. 1.2 mm wide, the short-stalked stellae often with up to 7 and more ferruginous rays, armed below on midrib with a few small broad-based prickles to 2 mm long, the longer ones recurved, firmly membranaceous, the lateral veins 6–8 per side, curved. *Petiole* 8–16 mm long, with tomentum as on the midrib below and usually with recurved prickles. *Inflorescence* terminal, soon overtopped and lateral, extra-axillary, racemose, 2–7 cm long, the peduncle 2–3 cm long and tomentose like the stem; buds in helicoid cyme at the tip, the rachis becoming straight as flowers develop; flowers ca. 10; pedicels 5 mm long in anthesis, 10 mm long in fruit, pilose; calyx campanulate, in anthesis the tube 5 mm long, the lobes 5, ovate-deltoid, acute, 5 mm long, in fruit the lobes 1 cm long, 6 mm wide, nearly glabrous within, pilose on outside with brown-ferruginous or brown-purple porrect stellate hairs, these drying yellow-brown, sessile or short-stalked, with short or obsolete rays and an elongate 2–4-celled midpoint; corolla stellate, without interpetalar tissue, pale lavender to lavender-purple, ca. 3.5 cm wide, the tube very short, the lobes lanceolate, 6 mm wide at base, 15 mm long, glabrous within, tomentose on outside along the midrib with sessile or short-stalked porrect-stellate hairs, the distal margins densely and minutely puberulent; stamens 5; filaments very short; anthers ca. 11 mm long, gradually tapering; style ca. 14 mm long, exceeding the anthers by 1–2 mm; stigma capitate, 1 mm long; ovary tomentose with sessile porrect stellae, those toward the tip often with midpoint to 2 mm long. *Fruit* a globose berry, 1–3 developing toward end of inflorescence, ca. 1.5 cm diam., or possibly somewhat larger when fully mature, green, mature color not known, sparsely tomentose; seeds flattened, reniform, foveolate, ca. 3.5 mm long.

Habitat. Growing in edges of savannas and woods and in cloud forests, from 320 to 650 m altitude, known only from the Altiplanicie de Nuria in the State of Bolívar on the border with Territorio Federal Delta Amacuro.

Solanum subg. *Leptostemonum* sect. *Micracantha*, essentially the "*Solanum lanceifolium* group" of Whalen (1984), consists of about 20 viny species characterized by exclusively cat-claw prickles on the

stem and on the main veins of the lower leaf surface. Like almost all other groups of New World *Solanum*, the section is much more diverse and species-rich in South America than in Central America, Mexico, and, especially, the United States. The many Central American and northern South American collections of section *Micracantha* have often been placed under the name *S. lanceifolium* Jacquin; but in the floras of Veracruz, Mexico (Nee, 1993), and the Venezuelan Guayana, these collections have been divided into four closely related species: *S. lanceifolium*, *S. adhaerens* Roemer & Schultes, *S. aturense* Dunal, and *S. tampicense* Dunal. There are several additional ill-defined species closely related to them in the Amazonian region.

Solanum nuricum differs from the core of the "*Solanum lanceifolium* group" by having unifoliate rather than difoliate, geminate sympodia, i.e., leaves single rather than geminate at a node, and a tomentose fruit. It most closely resembles *S. rupincola* Sendtner of Bahia and Espírito Santo in eastern Brazil, from which it differs by thinner, nonrevolute-margined leaves, smaller fruits, and wider calyx lobes. These two species belong among the more peripheral groups of section *Micracantha*, mostly Brazilian, whose relationships with the "*Solanum erythrotrichum* group" (Whalen, 1984) have not yet been clarified.

Paratypes. VENEZUELA. **Bolívar:** Altiplanicie de Nuria, 5 km from Hato de Nuria, E of Miamo, 10 Jan. 1961, *J. A. Steyermark 88283* (NY, US); Altiplanicie de Nuria, between camp and Agua Linda, 7 km E of Hato de Nuria, E of Miamo, 14 Jan. 1961, *J. A. Steyermark 88438* (NY, US); near the border (= Río Grande o Toro) with Territorio Federal Delta Amacuro, ca. 8°4′N, 61°44′W, 11 Apr. 1964, *F. J. Breteler 3768* (NY, VEN), 21 Apr. 1964, *F. J. Breteler 3882* (MER).

Literature Cited

Nee, M. 1993. Solanaceae II. *Solanum*. Flora de Veracruz, Fascículo 72. Instituto de Ecología, Xalapa, Mexico.

Whalen, M. D. 1984. Conspectus of species groups in *Solanum* subgenus *Leptostemonum*. Gentes Herb. 12: 179–282.

Una Nueva Especie de *Setaria* (Poaceae: Paniceae) para el Centro de Argentina

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RESUMEN. En el estudio que J. Pensiero está realizando de las especies de *Setaria* P. Beauvois que crecen en Sudamérica, se hallaron materiales procedentes del centro de Argentina que se proponen como una nueva especie, *Setaria alonsoi*, la que se caracteriza por su follaje glauco, vainas con cuello piloso y espiguillas globosas. Esta especie se describe, ilustra y se la compara con las especies afines.

ABSTRACT. In the course of the ongoing study by J. Pensiero of the species of *Setaria* P. Beauvois that grow in South America, material collected in the center of Argentina was found. A new species, *Setaria alonsoi*, is proposed based on these collections, characterized by its glaucous leaves, sheaths with pilous necks, and globose spikelets. The new species is described, illustrated, and compared with its relatives.

Setaria alonsoi Pensiero & Anton, sp. nov. TIPO: Argentina. Prov. Córdoba: Dpto. Sobremonte, Sierra del Norte, a ± 6 km al oeste de San Francisco del Chañar, camino a Lucio V. Mansilla, ± 700 m s.m., 30-I-1987, "frecuente aquí y allá, en palmar degradado," *Hunziker A. & R. Subils 24982* (holótipo, CORD). Figura 1.

Setaria onurus (Willdenow) Grisebach forma *grandiflora* Hackel, in Stuckert, Anal. Mus. Nac. Hist. Nat. Buenos Aires 21: 50. 1911. TIPO: Argentina. Prov. La Rioja: Dpto. Gral. San Martín, Ulapes, Ea. La Diana, 3-III-1907, *Stuckert 17082* (isótipos, BAF, CORD).

Herba foliorum glaucedine insignis, perennis, laxa, caespitosa, ca. 20–45 cm alta; in nodis inferioribus ramosa, vaginis apertis, glabris et internodis nudis, nudi glabri, umbrini; colli pilosi. Panicula erecta, spiciforme, ca. (2–)5–12 cm longa, rami brevissimi. Spiculae glabrae, ca. 3 mm longae × 2 mm latae, ovoideae, globosae; setae antrorsae-denticulatae; glumae inferiores longitudine (⅓–)½ spiculae partes aequantia, 3–5 nerves; glumae superiores quam spicula minuta tantum breviore, 7–9(–10) nerves. Anthoecia ovoidea, apiculata, leviter rugosa.

Planta perenne, de 20–45 cm de alto, cespitosa, con innovaciones intravaginales, bastante hojosa en su base, el follaje glauco; cañas acodadas o geniculadas en los nudos inferiores, por lo general ramificadas, de 1–2 mm de diámetro, entrenudos de 4–15 cm de longitud, normalmente desnudos, lisos; nudos en números de 2–4 por caña, oscuros, los inferiores cortamente pilosos, los superiores normalmente glabros. Vainas glabras, de 2–6 cm de longitud, redondeadas o notablemente aquilladas en el dorso, dando este último caso un aspecto iridáceo a la planta, cuello con pelos blancos, de 1–3(–5) mm de longitud, márgenes a veces ciliados sólo próximo a la lígula. Lígula membranáceo-ciliada, con la región membranosa hasta 0.5 mm de longitud, las cilias de 2–4(–6) mm de longitud, formando junto con los pelos del cuello de la vaina un manojo conspicuo de pelos blancos y sedosos. Láminas glaucas, lineares, estrechas, rígidas, de 3–15(–30) cm de longitud × (1–)2–3 mm de latitud, planas, conduplicadas, rara vez convolutadas, muy agudas hacia el ápice, glabras, ligeramente escabrosas. Inflorescencia una panícula, espiciforme, ± densamente florecida, alcanzandose a ver el raquis en casi toda su extensión, de (2–)5–12 cm de longitud × 0.6–1 cm de latitud incluyendo las setas, ramitas inferiores breves, de 0.5 cm de longitud; raquis ligeramente escabroso, glabro; pedicelos glabros, algo escabrosos, de 0.2–0.3 mm de longitud, acompañados por una seta antrorso-escabrosa hasta de 10(–13) mm de longitud. Espiguillas caedizas, ampliamente ovoides o globosas, verdosas, con las nervaduras de las glumas y glumelas conspicuas, glabras, de ca. 3 mm de longitud × 2 mm de latitud;

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Figura 1. *Setaria alonsoi* Pensiero & Anton. —A. Flor jóven. —B. Lígula. —C. Flor desarrollada. —D. Cuello de la vaina. —E. Hábito. —F. Espiguilla vista desde la gluma superior. —G. Cariopsis vista escutelar, con restos

gluma inferior alcanzando (⅓–)½ del largo de la espiguilla, 3–5 nervia, de ápice agudo o apiculado; gluma superior ⅘ o tan larga como el antecio fértil, 7–9(–10) nervia, apiculada; lemma estéril de igual largo que el antecio fértil o ligeramente mayor, 5–7(–8) nervia, apiculada; pálea estéril alcanzando ¾(–⅘) del largo de la pálea fértil, de 0.8–1 mm de latitud en su región basal. Antecio fértil ampliamente ovoide, castaño claro o pajizo, ca. 3 mm de longitud × 2 mm de latitud, con la lemma ligeramente rugosa en toda su extensión, y pálea de igual textura como la lemma, apiculado; lodículas 2, cuneiformes, de 0.3–0.5 mm de longitud. Cariopsis de contorno redondeado, de 1.5 mm de diámetro, escudete ligeramente superior a ¾ de su largo; hilo punctiforme.

Distribución geográfica y ecología. Especie hallada hasta el presente sólo en las provincias de La Rioja y Córdoba. Habita preferentemente ambientes degradados y terrenos modificados. Florece entre los meses de noviembre y mayo.

Parátipos. ARGENTINA. **Prov. Córdoba:** Dpto. Sobremonte, Sierra del Norte, a ± 6 km al oeste de San Francisco del Chañar, rumbo a Lucio V. Mansilla, ± 700 m s.m., "hojas color glauco," 30-I-1987, *Hunziker A. & R. Subils 25026* (CORD); San Francisco del Chañar, 8-XII-1944, *Balegno 347* (NY); a la entrada de San Francisco del Chañar, "al costado del camino en construcción, en la tierra removida," 28-V-1993, *Anton 169 y 176* (CORD).

El primer autor dedica esta especie a la memoria de José Mario Alonso (1926–1991), quien fuera Profesor de genética en la Facultad de Agronomía y Veterinaria, Universidad Nacional del Litoral, excepcional amigo, y maestro.

El estatus de *Setaria onurus* (Willdenow) Grisebach forma *grandiflora* Hackel, resulta confuso, ya que tal como señalara Nicora (1970), *Panicum onurus* Willdenow es sinónimo de *Setaria vaginata* Sprengel. Por otra parte, la descripción que da Grisebach para *Setaria onurus* (Willdenow) Grisebach corresponde, según Hitchcock (1920), a *Chaetochloa tenax* (Richards) A. Hitchcock [*Setaria tenax* (Richards) Desvaux].

En esta especie se ha observado la presencia de dos mecanismos reproductivos: cleistogamia y chasmogamia. La cleistogamia se reconoce por la presencia de restos de anteras adheridas al cariopsis (Fig. 1G). Esta cleistogamia no es de caracter estacional, ya que fue observada en ejemplares coleccionados tanto a principio de verano como al comienzo del invierno. Por otra parte, en otras espiguillas se han observado estigmas emergentes del antecio (Fig. 1F, L, I, y J), lo cual permitiría suponer también la presencia de chasmogamia.

Siguiendo el esquema taxonómico propuesto por Rominger (1962), esta especie pertenece al subgénero *Setaria* (P. Beauvois) Rominger, ya que las láminas carecen de pliegues longitudinales y todas las espiguillas están acompañadas por setas. *Setaria alonsoi* Pensiero & Anton se caracteriza por presentar el follaje glauco, las vainas con cuellos pilosos, los que junto con los pelos de la lígula forman un manojo de pelos largos y sedosos, espiguillas grandes, ampliamente ovoides o globosas y el antecio fértil con la lemma suavemente rugosa o papilosa. La siguiente clave permite diferenciar esta nueva especie de aquellas con las que se pudiera confundir:

1a. Espiguillas de 2.8–3 mm de longitud.
  2a. Vaina con cuello piloso, formando junto con los pelos de la lígula un manojo de pelos largos, blancos y sedosos; antecio fértil con la lemma suavemente rugosa o papilosa, opaca .... *Setaria alonsoi* Pensiero & Anton
  2b. Vaina con el cuello glabro; antecio fértil con la lemma totalmente lisa, lustrosa .. .. *Setaria cordobensis* Herrmann
1b. Espiguillas menores de 2.5 mm de longitud.
  3a. Raquis de la inflorescencia glabro; gluma superior alcanzando ⅘ o igualando el largo de la espiguilla; antecio fértil con la lemma suavemente rugosa, surcos apenas insinuados ..... *Setaria pampeana* Nicora
  3b. Raquis de la inflorescencia hirsuto; gluma superior alcanzando ¾ del largo de la espiguilla; antecio fértil con la lemma rugosa .....*Setaria macrostachya* Kunth

Literatura Citada

Hitchcock, A. S. 1920. The North American species of *Chaetochloa*. Contr. U.S. Natl. Herb. 22(3): 155–208.

Nicora, E. G. 1970. *Setaria*. *En:* Cabrera A., Flora de la Provincia de Buenos Aires. Colecc. Ci. Inst. Nac. Tecnol. Agropecu. 4(2): 439–460.

Rominger, J. M. 1962. Taxonomy of *Setaria* (Gramineae) in North America. Illinois Biol. Monogr. 29: 1–132.

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de antera adherida. —H. Cariopsis vista hilar. —I. Espiguilla vista de costado. —J. Porción de raquis. —K. Cariopsis vista transcorte. —L. Espiguilla vista desde la gluma inferior. —M. Antecio fértil vista ventral con pálea estéril. —N. Antecio fértil vista dorsal. Todo del holótipo (*Hunziker & Subils 24982*), con excepción de G, H, y K (*Anton 169*). La escala de la izquierda equivale a 0.5 mm y corresponde para A y C; las dos restantes representan 1 mm, la del medio vale para B y D, y la derecha para F–N. La escala de 2 cm corresponde para E. Dibujo por Leonor Sanchez.

Sarcolaena isaloensis, a New Species of Sarcolaenaceae from Isalo, South-central Madagascar

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ABSTRACT. *Sarcolaena isaloensis*, from the Isalo region of Madagascar, is described as a new species in the endemic family Sarcolaenaceae. It is unique in the genus by virtue of its very narrow leaves that lack induplicate prefoliation traces, and the long pubescence of its involucre.

The family Sarcolaenaceae, with 10 genera and ca. 33 species, is the largest of the 8 families of flowering plants endemic to Madagascar (Capuron, 1970; Cavaco, 1952; Takhtajan, 1986). Recent studies of *Sarcolaena* (Randrianasolo & Miller, in prep.) have shown that four collections from the Isalo region, on the southwest portion of the central plateau, represent a previously undescribed species. Isalo has been recognized as a center of endemism due to its unique sandstone, which is dissected by numerous valleys that are more humid than the surrounding area, essentially creating climatic islands (Humbert, 1927; Dorr et al., 1989). The Conspectus of the Vascular Plants of Madagascar Database lists 30 species with the specific epithet "isaloensis" or similar orthography (Schatz, pers. comm.).

Sarcolaena isaloensis A. Randrianasolo & J. S. Mill., sp. nov. TYPE: Madagascar. Fianarantsoa: plateau and valleys of Isalo, W of Ranohira, 800–1,250 m, 29 Jan.–2 Feb. and 8–10 Apr. 1955 (young buds), *Humbert 28695* (holotype, P; isotypes, MO, P[2]). Figure 1.

Arbor 6–10 m alta. Folium lamina anguste elliptica vel anguste ovata, 3–5.3 cm longa, 0.5–1.1 cm lata, apice acuto, mucronato, base obtusa, vernatione induplicata carente. Inflorescentia terminalis ex 1–2 floribus constans; involucro sicut pedunculo castaneo-sericeo. Fructus capsularis, 6–7 mm longus, 6–8 mm latus, in involucro omnino inclusus.

Trees 6–10 m tall; young twigs sericeous, later glabrate. Leaves alternate, simple, entire, coriaceous; leaf blade narrowly ovate to narrowly elliptic, 3–5.3 cm long, 0.5–1.1 cm wide, the apex acute, mucronate, the base obtuse, the adaxial surface glabrous, the abaxial sparsely brown sericeous, induplicate prefoliation traces absent; petiole 4–8 mm long, canaliculate, brown sericeous on the abaxial surface. Inflorescence terminal, the flowers solitary or paired. Young involucres surrounded by a brown sericeous caducous spathe, the exterior surface with stiff, spreading hairs, 2.5–3.5 mm long. Mature involucres very broadly obovate to widely depressed obovate, 9–11 mm long, 9–12 mm wide, the peduncle brown sericeous, 2–6 mm long. Mature flowers unknown. Fruits capsular, pericarp fragile, completely enclosed in the involucre, 6–7 mm long, 6–8 mm broad; seeds (1–)2(–6).

Distribution. This species is known only from Isalo, west of Ranohira, at the southern limit of the central domain of Madagascar's Eastern Region (Humbert, 1927) from 800 to 1,300 m.

Sarcolaena isaloensis has long (2.5–3.5 mm), stiff, spreading hairs that are evenly distributed on the involucre, a character state that it shares only with *S. eriophora* Thouars and *S. humbertiana* Cavaco, hypothesized to be its two closest relatives (Randrianasolo & Miller, in prep.). However, the leaves of *S. isaloensis* are highly distinct from those of the two species just mentioned; in *S. eriophora* they reach 8 cm in length, and in *S. humbertiana* up to 9 cm, whereas in the new species, leaves are only at a maximum 5.3 cm long.

The species of *Sarcolaena* are primarily distributed in eastern Madagascar. They occur mostly in the wet and moist forests of the east coast, the eastern part of the plateau and escarpment, and the Sambirano Domain (Cavaco, 1952). However, the range of *S. oblongifolia* F. Gérard extends into the dry, southern portions of the central plateau, which are still considered part of the eastern region (Humbert, 1927; Koechlin et al., 1974). Isalo is the driest region from which *Sarcolaena* is known, and both *S. isaloensis* and *S. oblongifolia* exhibit morphological characteristics that reflect this, including small leaves and short petioles, as well as a very reduced inflorescence. However, a number of features separate these two species. *Sarcolaena oblongifolia* has considerably longer and wider leaves than *S.*

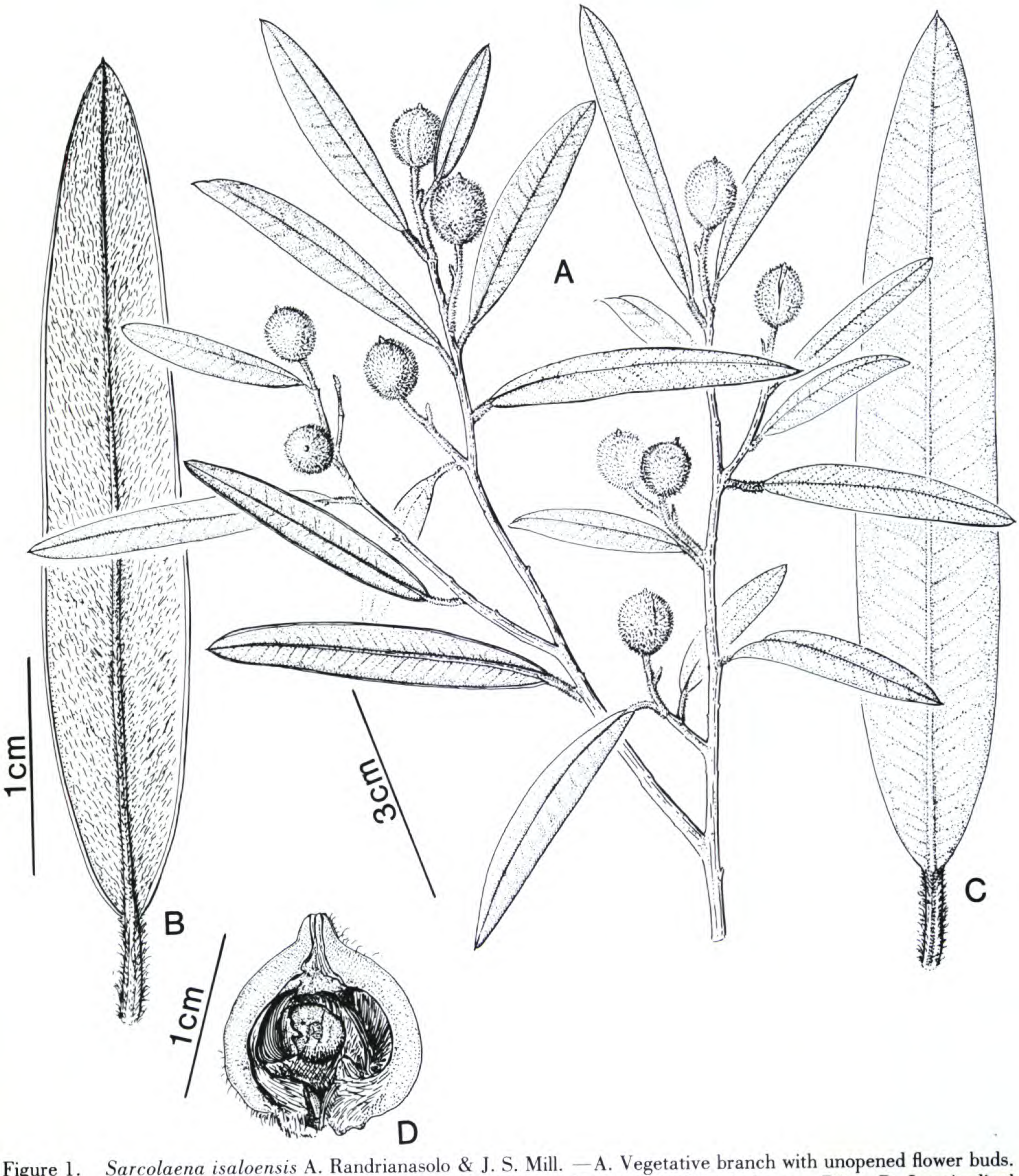

Figure 1. *Sarcolaena isaloensis* A. Randrianasolo & J. S. Mill. —A. Vegetative branch with unopened flower buds. —B. Upper leaf surface. —C. Lower leaf surface. (A–C from *Humbert 28695*, holotype, P.) —D. Longitudinal section of mature involucre (from *Leandri 3951*, P).

isaloensis: 3.2–9.2 by (1.1–)2–2.5(–3.4) cm versus 2.5–5.3 by 0.5–1.1 cm. Similarly, involucre size is markedly greater in *S. oblongifolia* than in the new species: 13–15 mm long, 13.5–14 mm in diameter versus 9–11 mm long and 9–12 mm in diameter. In addition to these quantitative differences in leaf and involucre features, *Sarcolaena isaloensis* lacks induplicate prefoliation traces on the leaf surface, a character present in all other members of the genus *Sarcolaena*.

Paratypes. MADAGASCAR. **Fianarantsoa:** Isalo massif, Betanimanga, 1,000–1,300 m, 18–20 Nov. 1960 (mature fruits), *Leandri 3951* (P); Isalo, Tapia woodland, 900 m, 24 Nov. 1932 (young buds), *Perrier de la Bâthie 16688* (P); Isalo massif near the sign of Isalo Sud, W of Ranohira, *SF 11675* (P).

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Literature Cited

Capuron, R. 1970. Observations sur les Sarcolaenaceae. Adansonia, sér 2, 10: 247–265.

Cavaco, A. 1952. Chlaenacées. *In:* Flore de Madagascar 126: 1–37.

Dorr, L. J., L. C. Barnett & A. Rakotozafy. 1989. Madagascar. Pp. 236–250 *in* D. G. Campbell & H. D. Hammond (editors), Floristic Inventory of Tropical Countries. New York Botanical Garden, Bronx, New York.

Humbert, H. 1927. Principaux aspects de la végétation de Madagascar. Mémoires de l'Académie Malgache. Fascicule 5.

Koechlin, J., J. L. Guillaumet & P. Morat. 1974. Flore et végétation de Madagascar. J. Cramer, Vaduz.

Takhtajan, A. L. 1986. Floristic Regions of the World. Univ. California Press, Berkeley.

A New Scandent Species of *Aegiphila* (Verbenaceae) from Costa Rica

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ABSTRACT. In preparing the treatment of the Verbenaceae for the *Manual de la Flora de Costa Rica*, *Aegiphila* specimens with large, cupulate, *Quararibea*-like fruits were found. These turned out to be a new species, here described as *A. quararibeana*. The new species is a canopy liana with the largest fruit of any lianescent species in the genus.

Aegiphila is a neotropical genus of about 150 species of shrubs, trees, and a few lianas. The species are found mainly in lowland, moist forests from Mexico, the West Indies, and Central America to Peru and northern Argentina (Rueda, 1992). According to the just-finished treatment of the family, the genus is represented in Costa Rica by ten species including this new one.

Aegiphila quararibeana Rueda, sp. nov. TYPE: Costa Rica. Heredia: Cantón de Sarapiquí, Llanura de San Carlos, Río Puerto Viejo, La Selva Biological Station, 50–150 m, 10°26′00″N, 84°01′00″W, 29 July 1993 (fl), *R. Rueda, O. Vargas, B. Hammel, N. Zamora & R. Aguilar 1414* (holotype, CR; isotypes, AAU, BM, CAS, COL, DUKE, F, G, GH, HNMN, K, LE, MEXU, MO, NY, PMA, QCNE, US, WIS). Figure 1.

Frutex scandens, ramulis minute puberulis. Folia petiolata laminis ovatis vel ellipticis, subtus punctatis, glabris, membranaceis, 4.5–12 cm longis × 2–7.5 cm latis. Inflorescentiae axillares, 2.5–3.5 cm longae × 1.5–2.5 cm latae, ramulis fertilibus lateralibus. Calyx campanulatus, tubo 5–12 mm longo, 4-dentatus; corolla hypocrateriformis, luteola, tubo ca. 2 cm longo, lobis ca. 1 cm longis. Fructus 2.5–3 cm longus et latus. Calyx in fructus cupulatus, lignosus, fructum dimidio obtegens.

Liana 8 cm diam., climbing at least 20 m into the canopy, the branches terete, lepidote and minutely puberulous, longitudinally striate, lenticellate. Leaves ovate-elliptic, the apex acute to acuminate, the base obtuse to truncate, 4.5–12 cm long, 2–7.5 cm wide, membranaceous, 5–7 conspicuous lateral veins per side, the tertiary veins inconspicuous, minutely scattered-puberulent above, glabrous to subpuberulous below; both surfaces dark glandular-punctate, but more so beneath; petioles 0.6–2 cm long, minutely pubescent, puberulous. Inflorescence axillary cymes, fleshy, mainly on lateral branches, 2.5–3.5 cm long, 1.5–2.5 cm wide; bracts foliaceous, ca. 5 mm long; bractlets subulate, ca. 2 mm long. Flowers with the calyx campanulate, mostly 4-dentate, thick, tube 5–12 mm long, 3–5 mm wide, teeth ca. 1 mm long; corolla hypocrateriform, fleshy, yellowish, tube ca. 2 cm long, 5–7 mm wide at mouth of tube, 4-lobed, the lobes ca. 1 cm long, the indument of bracts, bractlets, calyx, and corolla mainly glandular-lepidote with minute scattered-appressed trichomes, the corolla-tube pubescent inside, stamens 4, inserted in the corolla-tube at 4–6 mm below the mouth, filaments ca. 4 mm long, anthers ca. 1 mm long, slightly longer than the corolla-tube; stigma bifid, 12 mm long plus 6 mm of each branch; ovary oblong-ovate, 2.5 mm long. Fruit 2.5–3 cm long and wide; fruiting calyx cupulate, woody, covering half of the fruit.

This species is perhaps not uncommon in wet forest in Costa Rica as judged by fallen fruits that M. Grayum and B. Hammel remember having seen along the trails in La Selva Biological Station. However, these plants are difficult to see from the ground. Having made a specimen in July 1993 from a fallen branch with the unusual large fruits, Orlando Vargas took us to what turned out to be the type locality. The few specimens available in herbaria, including the types, are from canopy lianas growing in tangles of other lianas in the tops of canopy trees and are virtually invisible from the ground without binoculars. We were able to collect the plant only after trying different tree-climbing and slingshot-rope saw methods. The branches collected with flowers in different stages in January also bore the calyces from the previous year.

Aegiphila quararibeana is distinct within the genus by being a high climber with larger fruits than any other lianescent species in the genus. It is most similar in gross morphology to the Amazonian *A.*

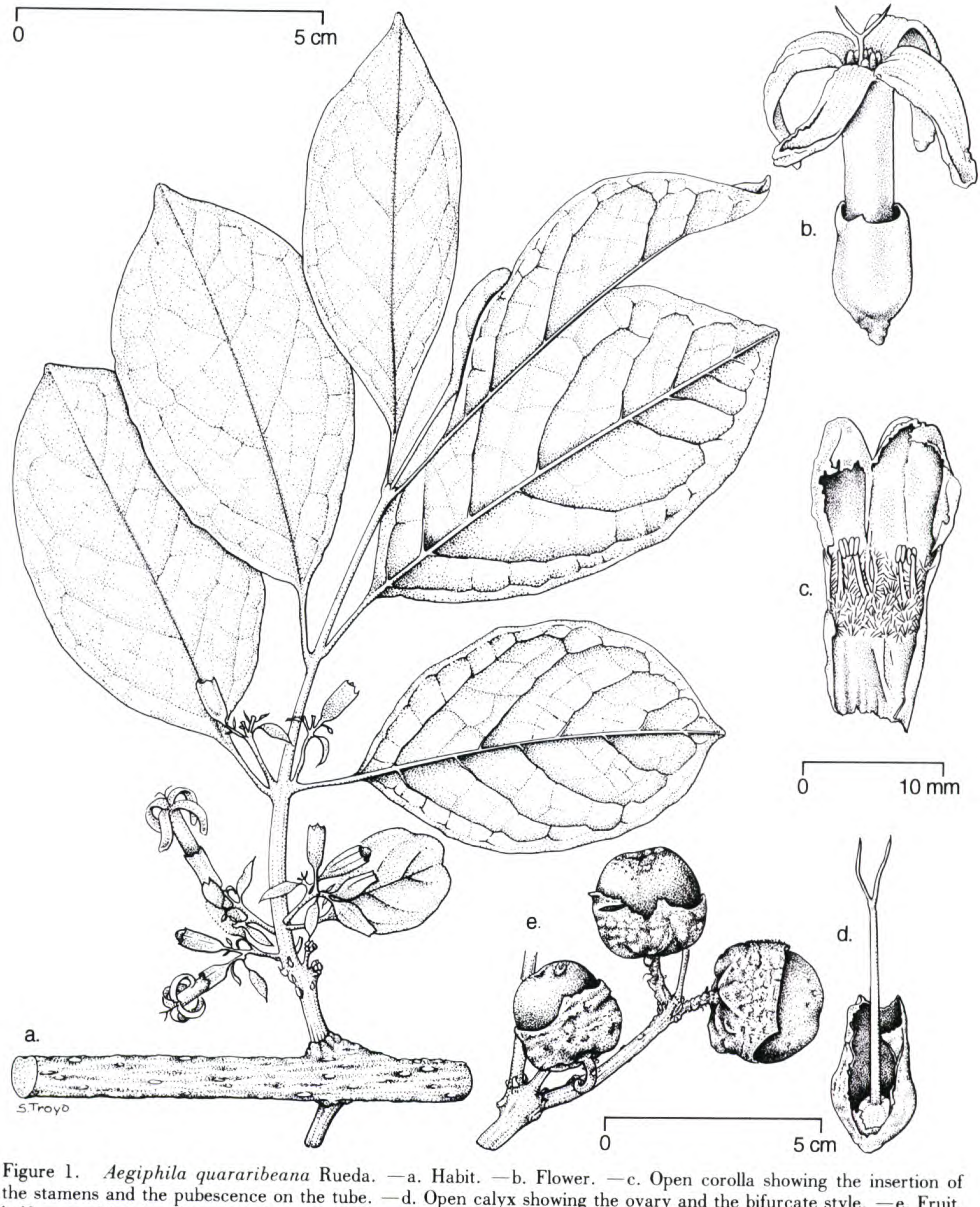

Figure 1. *Aegiphila quararibeana* Rueda. —a. Habit. —b. Flower. —c. Open corolla showing the insertion of the stamens and the pubescence on the tube. —d. Open calyx showing the ovary and the bifurcate style. —e. Fruit, half covered by the calyx. a–d from *Rueda et al. 1414;* e from *Vargas 415*. a, e: 5 cm scale bars; b, c, d: 10 mm scale bar.

macrantha Ducke, which has fruits nearly as large, but differently shaped and only basally covered by the calyx. *Aegiphila macrantha* also differs in having long-peduncled, more conspicuously bracteate inflorescences and corollas glabrous within. Among Mesoamerican species, *A. quararibeana* resembles *A. anomala* Pittier, with which it shares axillary and relatively short-peduncled inflorescences and large fruits. However, these two species can easily be separated because *A. quararibeana* flowers are 4-merous, whereas *A. anomala* has 5-merous flowers and is a tree rather than a liana (Standley, 1938).

Paratypes. COSTA RICA. **Alajuela:** Monteverde Reserve, Atlantic side, 1,580–1,680 m, 25 May 1977 (fl), *Dryer 1397* (CR). **Heredia:** Cantón de Sarapiquí, Llanura de San Carlos, Río Puerto Viejo, La Selva Biological Station, 10°26′00″N, 84°01′00″ W, 50–150 m, 29 July 1993 (fr), *Vargas 415* (CR, MO). **Puntarenas:** Cantón de Osa, N side of Rancho Quemado, on road to Estero Guerra, 8°43′30″N, 83°34′50″W, 320 m, 9 Mar. 1992 (fl), *Marín 413* (CR, MO, US).

Acknowledgments. I thank Michael Grayum and Barry Hammel for reviewing the manuscript, Silvia Troyo for the excellent drawing of the species, and the Museo Nacional/Herbario Nacional de Costa Rica and the Instituto Nacional de Biodiversidad for providing facilities for the research. My travel to Costa Rica was supported by a grant from the National Science Foundation (BSR-9006449) awarded to the Missouri Botanical Garden.

Literature Cited

Rueda, R. M. 1992. A new species of *Aegiphila* (Verbenaceae) from Colombia. Novon 2: 167–168.

Standley, P. C. 1938. Verbenaceae. Pp. 993–1015 *in* P. C. Standley, Flora of Costa Rica. Publ. Field Mus. Nat. Hist., Bot. Ser. 18: 783–1616.

Two New Species of *Scleria* Section *Scleria* (Cyperaceae) from the Neotropics

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ABSTRACT. Two new species are described: *Scleria skutchii* M. T. Strong & J. R. Grant, a scrambling, vinelike, branching, high-climbing sedge with sharp, spinulose leaf margins, pendulous inflorescences of purple spikelets, a long-stipitate hypogynium, and achenes with a curved apex, from Costa Rica and northwestern Colombia, related to *S. macbrideana* Gross; and *Scleria triquetra* M. T. Strong, an erect to ascending sedge that has trigonous achenes bearing tubercles with tufts of trichomes on the angles, from northeastern South America, related to *S. huberi* C. B. Clarke. A key to the scandent species of *Scleria* sect. *Scleria* in Central America and northwestern Colombia is provided, and an illustration, SEM photograph of the mature achene, and comparison to similar taxa are given for each species.

Earl Core's (1936) monumental treatment of the American species of *Scleria* Bergius and his (1965) treatment of the Guayana Highlands species laid a solid foundation for further study of species occurring in the Neotropics. Examination of specimens has led to the discovery of two new species in *Scleria* sect. *Scleria*. The genus is typified by *Scleria flagellum-nigrorum* Bergius. Section Euscleria of Core (1936), the nominate section of the genus which contains *S. flagellum-nigrorum*, is not permitted by the *International Code of Botanical Nomenclature*, Article 21.3 (Greuter et al., 1988). Species of *Scleria* sect. *Scleria* are distinguished from other species in the genus by having a 3-lobed hypogynium with entire lobes.

Scleria skutchii M. T. Strong & J. R. Grant, sp. nov. TYPE: Costa Rica. Puntarenas: Canton Golfito, Refugio Nacional de Fauna Silvestre Golfito, Golfito, along road (7 km long) from the soccer field to the microwave transmitter tower, 8°38′N, 83°11′W, 25 Dec. 1992, *Grant & Rundell 92-02087* (holotype, US sheet #3242501; isotypes, BM, CLEMS, CR, F, GH, K, MARY, MO, NY, P, VDB). Figures 1, 3B.

Species haec a *Scleria macbrideana* Gross differt foliorum pagina abaxiali pilosa; inflorescentiis (2–)5–10 paniculatis, pendulis, flexuosis; prophyllis basi longo-ciliatis in ramis lateralibus; spicularum pedicellis ad 1 cm longis; acheniis ovatis, apice anguste rotundo et leviter curvirostrato, pilis brevibus dispersis vel in lineis indistinctis.

Coarse perennial, with thick, nodose rhizome; vinelike, climbing or scrambling high over vegetation; roots coarse, thick. Culms trigonous, elongate, branching from upper nodes, to 10 m long, 3–5 mm wide, to 10 mm wide near base, scabrous to spinulose on angles, finely ribbed above, coarsely ribbed and channeled near base, glabrous to sparsely pilose. Leaves many; blades green, to 6 dm long, 4–14 mm wide, apex long-acuminate, abaxial side pilose, adaxial side glabrous except at base, a few hairs sometimes along the midvein, harshly spinulose along margins and midvein beneath, the barbs up to 0.5 mm long; sheaths green, closely overlapping in young foliage, finely veined, pilose to glabrescent at maturity, scabrous to spinulose on the angles, the convex contraligule firm, pubescent to glabrescent at recurved apex with hairs to 1 mm long. Inflorescence of (2–)5–10 axillary panicles from the upper sheaths; panicles borne on long, slender peduncles becoming pendulous at maturity; panicle branches smooth, or scabrous only near base, ascending, elongate, minutely scabrous on angles; bractlets linear-lanceolate to setaceous, scabrous, long-ciliate on margins at expanded base. Spikelets unisexual; pistillate spikelets elliptic to elliptic-obovate, 5–7 mm long, 3 mm wide, on slender, trigonous to subcompressed pedicels up to 1 cm long; staminate spikelets oblong-ovate, 3–4 mm long, 1–2 mm wide, usually on shorter pedicels than the pistillate, but sometimes up to 1 cm long. Pistillate scales 6–9 (including the reduced fertile scale); lower sterile scales ovate, 2–2.5 mm long, 1.5–2.0 mm wide; upper sterile scales widely ovate, 3.0–3.5 mm long, 3.5–4.5 mm wide, green with purple margins, at maturity becoming darker, usually tinged with purple, glabrous, ciliate along margins near base, the apex short-mucronate, scabrous, recurved at

Figure 1. *Scleria skutchii* M. T. Strong & J. R. Grant. —A. Habit. —B. Culm base showing knotty rhizomes. —C. Detail of abaxial side and margin of leaf blade. —D. Detail of inflorescence branch showing staminate and pistillate spikelets. —E. Achene and hypogynium. (A and B from *Grant & Rundell 92-02062*; C–E from *Grant & Rundell 92-02087*.)

maturity; fertile scale reduced, narrowly obtrullate, as long as the sterile, the apex like the sterile. Staminate scales many, the lower similar to pistillate, 2.0–2.5 mm long, 1.5–2.0 mm wide, the upper scales (hidden at apex) ovate-lanceolate, 1.8–2.0 mm long, ca. 1.0 mm wide, membranous. Stamens 2 or sometimes 3 in terminal scales, the filaments connate at base; anthers exserted at anthesis, narrowly lanceolate, pale yellow, 1.3–1.5 mm long, basifixed, thecae parallel, longitudinally dehiscent, the apex with a sharp, shiny, bristlelike appendage, 0.3–0.5 mm long. Style 3-branched, the unbranched part glabrous, 0.2 mm thick, the branches scaly. Hypogynium long-stipitate at base, 3-lobed at apex, the lobes rounded-obtuse, red-blotched, the margin revolute; cupula long-stipitate, 3-lobed. Achene ovoid, narrowly rounded to recurved summit, 4–5 mm long (including hypogynium), 2–2.5 mm wide, purple, variegated with white above the lobes of the hypogynium, sparsely pilose, with trichomes scattered or in indistinct lines.

Scleria skutchii occurs on steep slopes in rainforest and second growth thickets bordering open habitat such as fields, roadsides, and rivers.

This species is named in honor of Alexander F. Skutch, the first collector of this plant and eminent naturalist who has explored the American tropics for well over 60 years, writing about the tropical rainforest and its inhabitants, particularly birds and plants from his tropical farm in Costa Rica. *Scleria skutchii* is here described in collaboration with Jason R. Grant of the University of Maryland, College Park, Maryland (MARY). Grant has recently made some superb flowering and fruiting collections of this plant in Costa Rica, which have been of great value in describing this species.

Adams (1994) considers plants here described as *Scleria skutchii* to be conspecific with *S. macbrideana* Gross. *Scleria skutchii* is closely related to *S. macbrideana*, but differs in a number of characters. The leaves of *S. skutchii* are pilose abaxially; the inflorescence becomes pendulous at maturity with elongate and flexuous branches; the prophylls of lateral branches are long-ciliate at base; the spikelet pedicels are elongated up to 1 cm; and the achenes are ovoid, narrowly rounded to a slightly recurved tip, with short hairs that are scattered or in indistinct lines. The leaves of *S. macbrideana* are smooth; the inflorescence is erect and spreading at maturity; the branches are stiff, ascending to divaricate; the prophylls are not ciliate at base; the spikelets are sessile or on pedicels less than 1 cm long; and the achenes are conical, with distinct horizontal lines of minute hairs.

A number of other scandent and semi-scandent species of *Scleria* sect. *Scleria* occur in Central America and northwestern Colombia (Depts. Antioquia and Chocó). The most common is *S. secans* (L.) Urban, which can form impenetrable thickets. Although this species shares the same scrambling, vinelike habit of *S. skutchii*, it is not closely related. *Scleria secans* is readily distinguished from *S. skutchii* by its contraligule, which bears a scarious appendage at the apex; pistillate spikelets with 4 scales; short hypogynium; and shiny white, globose-ovoid achenes that are rounded at the apex. The widespread, neotropical species *S. flagellum-nigrorum* has close affinities to *S. skutchii*. It differs in having stiff panicle branches; spikelet pedicels less than 5 mm long; short hypogynium; and ellipsoid-globose achenes, 3–3.5 mm wide, with a rounded apex that bears a blunt, obscurely curved tip. Two other species that share the scandent habit of *S. skutchii* but are not otherwise closely related are *S. bracteata* Cavanilles and *S. vaginata* Steudel. *Scleria bracteata* can be readily distinguished from *S. skutchii* by its terminal and upper 1(–2) axillary inflorescence panicles that bear only staminate spikelets and lower axillary panicles that bear only pistillate spikelets; in contrast, all inflorescence panicles of *S. skutchii* bear both staminate and pistillate spikelets. *Scleria vaginata* can be readily distinguished from *S. skutchii* by its wing-angled sheaths; those of *S. skutchii* are wingless.

Paratypes. COSTA RICA. **Puntarenas:** between Golfo Dulce and Río Térraba, 30 m, Dec. 1947, *Skutch 5398* (US); above Golfito along trail to the television tower, 100–300 m, 8°38′N, 83°10′W, 27 & 28 Jan. 1967, *Burger & Matta U. 4736* (BM, F); Esquinas Ridge, Osa Península, 150–250 m, Jan. 1983, *Gómez 19662* (BM, CR, MO); Golfito, along the 7 km road from the soccer field to the microwave transmitter tower above town, ca. 300 m, 8°38′N, 83°11′W, 8 Jan. 1992, *Grant & Rundell 92-1781* (BM, CR, US); Canton Golfito, Refugio Nacional de Fauna Silvestre Golfito, 2 km NW of Golfito on the road to Briceño, 8°38′N, 83°13′W, 25 Dec. 1992, *Grant & Rundell 92-02073* (CR, F, US); Canton Osa, Osa Peninsula, on road from Rancho Quemado toward Drake, 24 Dec. 1992, *Grant & Rundell 92-02062* (B, BM, C, CR, F, MEXU, MICH, MO, NY, TEX, UCLA, US). COLOMBIA. **Dept. Antioquia:** Pavarandó, bosque junto al puente sobre el Río Pavarandó, 150–200 m, 5 Mar. 1987, *Fonnegra et al. 1770* (HUA, MO).

Below is a key to the scandent species of *Scleria* sect. *Scleria* that occur in Central America and the departments Antioquia and Chocó in Colombia. Unlike the erect to ascending culms of other species of *Scleria* sect. *Scleria*, the habit of these species is typically vinelike. At maturity, the culms are greatly elongated with many nodes and clamber or are scandent over other vegetation. Although *S.*

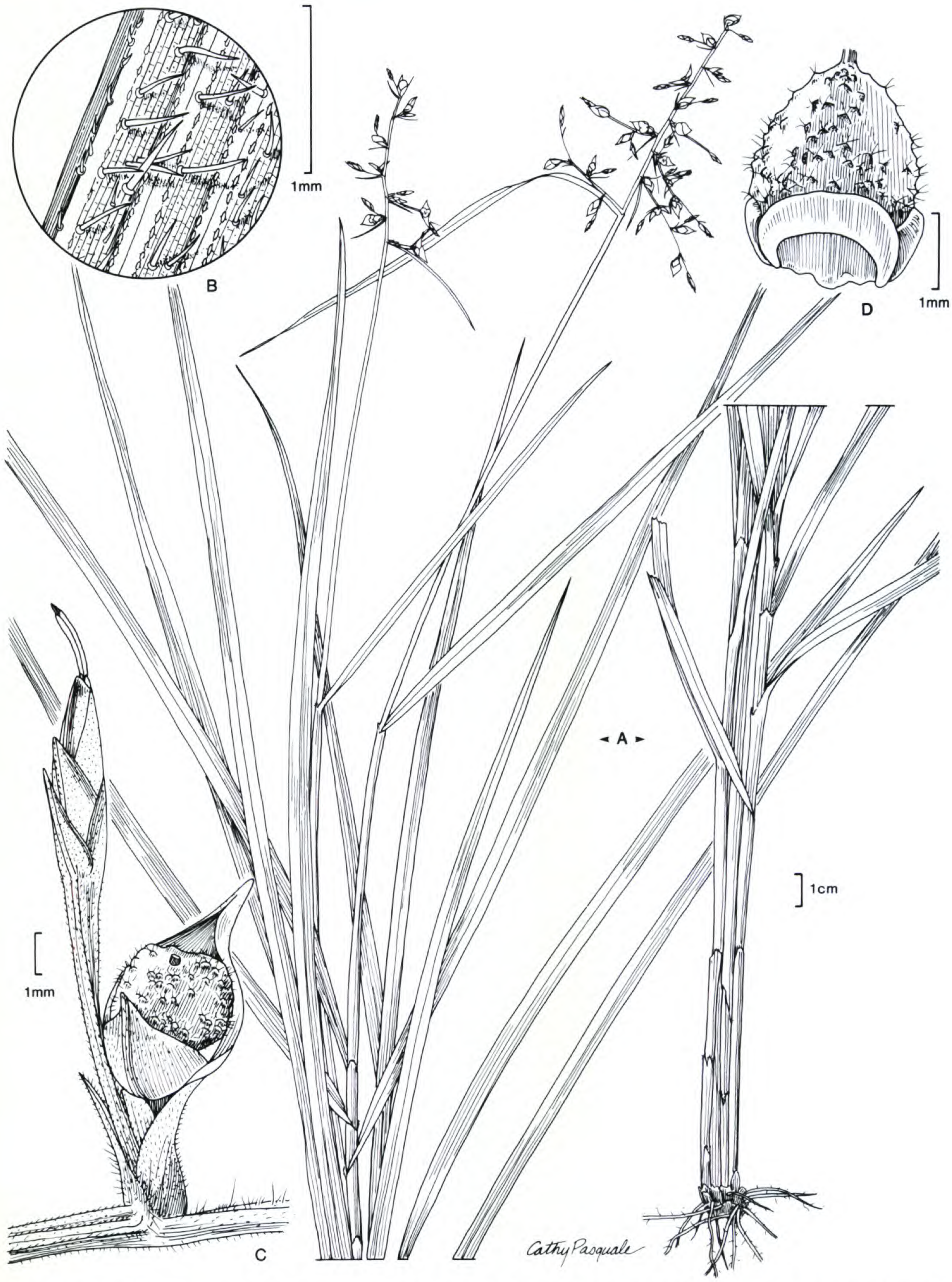

Figure 2. *Scleria triquetra* M. T. Strong. —A. Habit. —B. Detail of abaxial side and margin of leaf blade. —C. Detail of inflorescence branch showing staminate and pistillate spikelets. —D. Achene and hypogynium. (A from *Oldeman T.922;* B from *de Granville 3751;* C from *de Granville 1496;* and D from *de Granville et al. 9777.*)

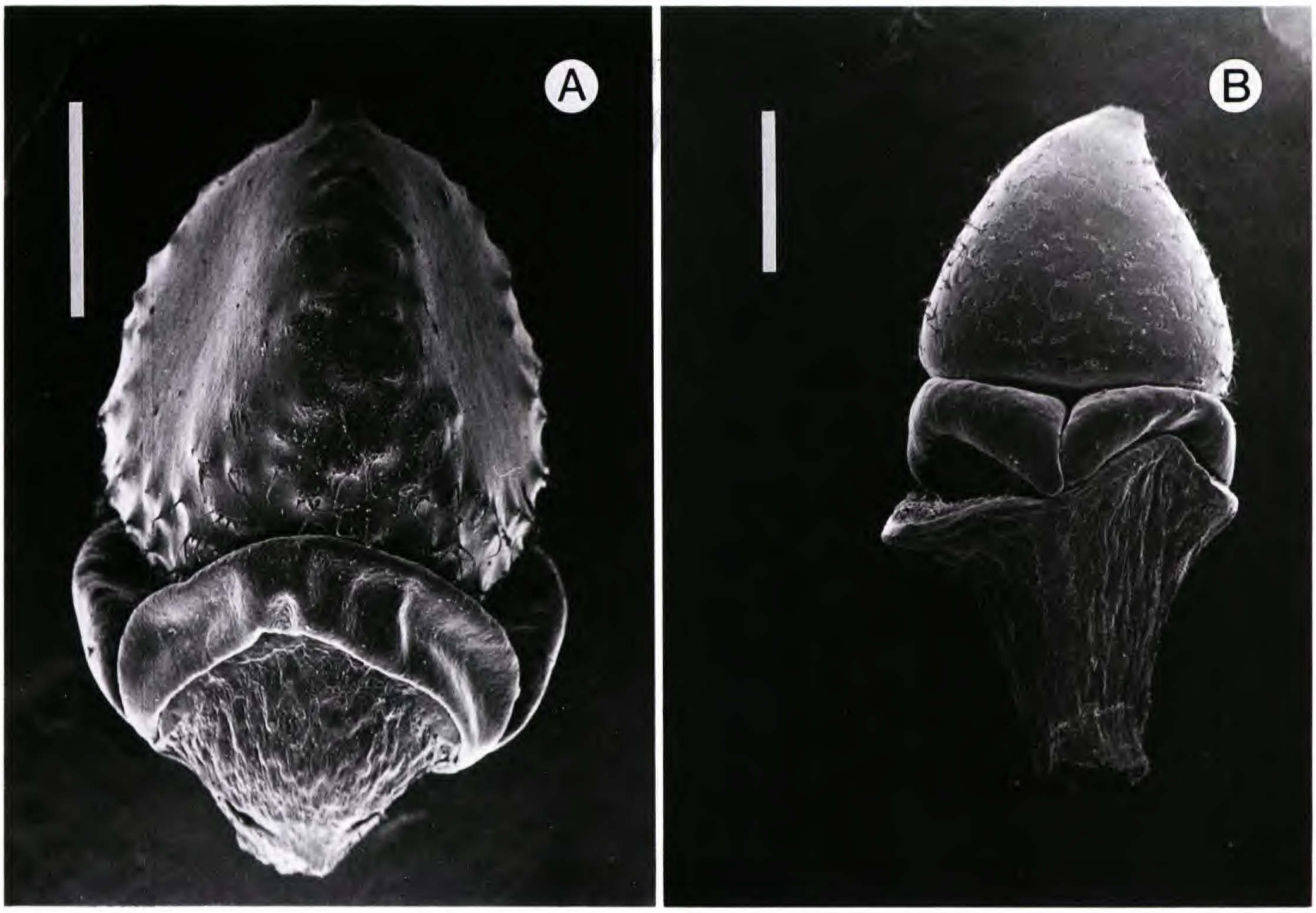

Figure 3. SEM photomicrographs of *Scleria* achenes with hypogynium and cupula attached. Scale bar = 1 mm. —A. *Scleria triquetra*. —B. *Scleria skutchii*. (A from *de Granville et al. 9777* and B from *Grant & Rundell 92-02087*.)

macbrideana was described from Peru (Macbride, 1931), and I have seen no specimens from Central America or northwestern Colombia, I have included it in the key for comparison.

KEY TO THE SCANDENT SPECIES OF *SCLERIA* SECT. *SCLERIA* THAT OCCUR IN CENTRAL AMERICA AND NORTHWESTERN COLOMBIA

1a. Contraligule of the sheath bearing a scarious appendage at the apex ..... *S. secans*
1b. Contraligule of the sheath acute or rounded, the apex entire or with a fringe of hairs.
  2a. Terminal and 1(–2) upper axillary inflorescence panicles strictly bearing staminate spikelets, the lower axillary panicles strictly bearing pistillate spikelets ..... *S. bracteata*
  2b. All inflorescence panicles bearing both staminate and pistillate spikelets.
    3a. Sheaths winged on the angles ..... *S. vaginata*
    3b. Sheaths not winged on the angles.
      4a. Hypogynium short; mature achene ellipsoid-globose, 3–3.5 mm wide, the apex rounded with a blunt, obscurely curved tip ..... *S. flagellum-nigrorum*
      4b. Hypogynium long-stipitate; mature achenes conical or ovoid, 2–2.5 mm wide.
        5a. Mature inflorescence panicles erect and spreading with stiff, ascending to divaricate branches; prophylls of lateral branches eciliate at base; spikelet pedicels sessile or less than 1 cm long; achenes conical ..... *S. macbrideana*
        5b. Mature inflorescence panicles pendulous with elongate and flexuous branches; prophylls of lateral branches long-ciliate at base; spikelet pedicels elongate, up to 1 cm long; achene ovoid, narrowly rounded to recurved summit ..... *S. skutchii*

Scleria triquetra M. T. Strong, sp. nov. TYPE: French Guiana. Camp no. 3, Roche no. 1 Akouba Booka Goo Soula, Bassin du Haute, 500 m au Sud-Ouest, 160 m, 2°36′N, 54°01′W, 27 Aug. 1987, *de Granville et al. 9777* (holotype, US sheet #3117503; isotypes, CAY, P). Figures 2, 3A.

Species haec a *Scleria huberi* C. B. Clarke differt foliis 3–8 mm latis, infra papillos minutos seriales; contraligula vaginae triangulari apice acuta; inflorescentiis 1(–2) pan-

iculatis; spiculis pistillatis 4 squamis; acheniis apice apiculatis, trigonis, lateribus leviter concavis laevibus in angulis tuberculis trichomatibus.

Rhizomatous perennial, ascending to scandent. Culms trigonous, 0.5–1.2 m tall, 2–3 mm wide, spinulose on margins, strigose on sides, dark red near base. Leaves 6–7; blades 3–8 mm wide, short on basal sheaths, up to 5 dm long on cauline sheaths, 3-costate, greenish to pale brown, glabrous and smooth adaxially, cellular-reticulate, minutely papillate abaxially in rows, particularly along veins, mixed with erect, stiff, crystalline, pustulate-based trichomes, scabrous on margins, antrorsely spinulose on midrib beneath, long-acuminate to blunt tip; sheaths distinctly veined, strigose, with pustulate-based hairs, particularly on veins, spinulose on margins, bright red or brownish to reddish brown, with a triangular contraligule, 3–5 mm long, minutely ciliate on margin, the veins straight, not anastomizing at the subacute apex. Inflorescence a single, terminal, open panicle or sometimes a smaller second one below, 10–20 cm long; involucral bract 1, leaflike, 2–7 mm wide, up to 25 cm long; branches trigonous, stiff, ascending to divergent, copiously ciliate-scabrous on angles and sides, intermixed with long, crystalline trichomes, the short prophylls on lateral branches with a dark, reddish brown to blackish gland at base; bractlets linear-setaceous, scabrous on margins and midvein beneath, ciliate on margins at base, with long crystalline trichomes. Spikelets unisexual; pistillate spikelets 1-flowered, ovate, 5–7 mm long, 2–3 mm wide, expanding with maturing achene, sessile to short-pedicelled; staminate spikelets many-flowered, oblong-ovate, ca. 5 mm long, 1–2 mm wide, on pedicels up to 5 mm long. Pistillate scales 4 (including the reduced fertile scale); sterile scales ovate, 4–6 mm long, 2.5–4 mm wide, 1-nerved, curvate-keeled, brown to dark brown, dark reddish brown to purple-black on margins and at apex, glabrous or scabrous on sides near apex, the keel straight to slightly recurved at maturity; fertile scale reduced, narrowly lanceolate, as long as the sterile, the apex acuminate. Staminate scales many, the lower three like the pistillate, scabrous on sides, the upper oblong-ovate, membranous, brown to reddish brown, with acute apex, 3–4 mm long, 1–2.5 mm wide. Stamen 1; anthers exserted at anthesis, 2–2.5 mm long, basifixed, thecae parallel, longitudinally dehiscent, the apex with a triangular reddish appendage, 0.2–0.4 mm long. Style 3-branched, ⅓ to ½ length of style, the branches scaly. Hypogynium with 3 broadly rounded to subtruncate lobes, pale green or yellowish, smooth, with thickened, revolute margin, the cupula with 3 broadly rounded lobes. Achene trigonous, broadly ovoid, 3.5–4 mm long (including hypogynium), 2.4–3 mm wide, with slightly concave sides, whitish to grayish white, apiculate at apex, the angles with tubercles bearing tufts of trichomes.

Scleria triquetra occurs in open to semi-open habitat such as thickets, coppices, forest bordering creeks, rivers, and trails, and in clearings caused by tree falls.

The distinguishing characters of *Scleria triquetra* that separate it from most other species of *Scleria* sect. *Scleria* in the Neotropics are its trigonous achenes with concave sides and deeply lobed hypogynium with thickened, revolute margins. Species of *Scleria* sect. *Scleria* in the Neotropics typically have globose, ovoid, or ellipsoid achenes that are at most obscurely angled. An exception is *S. parallela* Clarke, presently known only from Colombia and Venezuela. This species also has trigonous achenes but is not related to *S. triquetra*. The achenes of *S. parallela* are minutely transversely verrucose over the entire surface and the hypogynium has short, ovate, truncate lobes. *Scleria triquetra* is closely related to *S. huberi* in habit, inflorescence, and floral morphology, but differs from it in a number of characteristics. The leaf blades of *S. triquetra* are narrow (3–8 mm wide) and have minute papillae concentrated in rows along the veins on the abaxial surface (Fig. 2B); the contraligule of the sheath is triangular with a subacute apex; there are 1(–2) inflorescence panicles from the upper sheaths; the pistillate spikelets have 4 scales; and the achenes are apiculate at the apex, trigonous, with smooth slightly concave sides, the angles with tubercles bearing tufts of trichomes. The leaf blades of *S. huberi* are wider (10–24 mm wide) and lack the minute papillae along veins on the abaxial surface; the contraligule of the sheath is short and rounded; there are (1–)2–3 inflorescence panicles from the upper sheaths; the pistillate spikelets have 6 scales; and the achenes are prominently beaked, ellipsoid-globose, with tubercles of trichomes evenly distributed over the surface.

Paratypes. FRENCH GUIANA. Tumuc Humac, frontière Guyane-Surinam, Nord du Kassabatiki, le long du chemin indien joignant la Ouarémapaan'au Mapaoni, 370 m, 6 Sep. 1972, *de Granville 1496* (CAY); massif des Emerillons, base du versant sud, 200 m, 6 Sep. 1980, *de Granville 3751* (CAY); massif des Emerillons, centre sud, ca. 250 m, 10 Sep. 1980, *Cremers 6613* (CAY); montagne Alikéné, rive gauche du Bas-Camopi, 30 Aug. 1973, *Oldeman T.922* (CAY); montagne Bellevue de l'Inini, zone orientale, versant sous le vent, 650 m, 27 Aug. 1985, *de Granville et al. 7879* (CAY, NY, P, U). BRAZIL. **Pará:** Jari, estrada do Munguba, km 14, 16

Apr. 1969, *Silva 2199* (INPA, MO), estrada entre Monte Dourado e Munguba, km 4, 18 May 1969, *Silva 1977* (INPA, MO, NY).

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Literature Cited

Adams, C. D. 1994. *Scleria* (Cyperaceae). Pp. 476–484 *in:* G. Davidse, M. Sousa S. & A. O. Chater (editors), Flora Mesoamericana, Vol. 6, Alismataceae a Cyperaceae. Universidad Nacional Autónoma de México, México D.F.; Missouri Botanical Garden, St. Louis; The Natural History Museum, London.

Core, E. S. 1936. The American species of *Scleria*. Brittonia 2: 1–105.

———. 1965. Cyperaceae tribe Sclerieae. *In:* B. Maguire, The Botany of the Guayana Highlands 6. Mem. New York Bot. Gard. 12: 54–69.

Greuter, W., H. M. Burdet, W. G. Chaloner, V. Demoulin, R. Grolle, D. L. Hawksworth, D. H. Nicolson, P. C. Silva, F. A. Stafleu, E. G. Voss & J. McNeill. 1988. International Code of Botanical Nomencalture. Koeltz Scientific Books, Königstein, Germany.

Macbride, J. F. 1931. Spermatophytes, mostly Peruvian—IV. Field Mus. Nat. Hist., Bot. Ser. 11: 39–69.

Taxonomic Notes on *Psychotria* (Rubiaceae) in Western South America

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ABSTRACT. The new name *Psychotria cardiomorpha* C. M. Taylor & A. Pool replaces *P. cordifolia* HBK; the new combinations *Psychotria cardiomorpha* subsp. *perpusilla* (Steyermark) C. M. Taylor & A. Pool, *P. campyloneuroides* (Standley) C. M. Taylor, *P. conephoroides* (Rusby) C. M. Taylor, *P. gentryi* (Dwyer) C. M. Taylor, *P. jervisei* (Standley) C. M. Taylor, *P. ostreophora* (Wernham) C. M. Taylor, *P. cuatrecasasii* (Standley ex Steyermark) C. M. Taylor, and *P. timbiquensis* (Standley) C. M. Taylor apply to species formerly treated in *Cephaëlis*; the new name *P. cordobensis* C. M. Taylor applies to *C. crassifolia* Standley; and additional synonymy is suggested.

Psychotria L. is estimated to include about 1,000 species (Hamilton, 1989), with perhaps 500 of these neotropical. This genus is represented in the Neotropics by three subgenera: subg. *Tetramerae* Petit, pantropical, with perhaps three species found in the Caribbean region; subg. *Psychotria*, pantropical, found throughout the Neotropics but perhaps most speciose in the Caribbean region; and subg. *Heteropsychotria* Steyermark, exclusively neotropical, also found throughout this region though most speciose in South America. *Psychotria* has been treated only on a country or regional basis, most extensively by Steyermark (1972, 1974). He determined that *Cephaëlis* Swartz included a polyphyletic assemblage of species better placed in subgenus *Heteropsychotria*, but did not publish transfers for all of the species affected.

We present below resolution of a nomenclatural problem, further transfers into *Psychotria* of species formerly placed in *Cephaëlis*, and notes on synonymy for several species described from western tropical South America.

NOMENCLATURAL NOTES

During review of western South American Rubiaceae for preparation of the *Catalogue of the Flowering Plants and Gymnosperms of Peru* (Brako & Zarucchi, 1993), the following nomenclatural problem and previously unreported synonymy were discovered.

Psychotria cardiomorpha C. M. Taylor & A. Pool, nom. nov. Replaced name: *Psychotria cordifolia* HBK, Nov. Gen. Sp. 3: 365. 1819, nom. illeg., not *Psychotria cordifolia* F. Dietrich, Vollst. Lex. Gärtn. 7: 618. 1807, nom. superfl. for *Psychotria macropoda* Ruiz & Pavón (= *Geophila macropoda* (Ruiz & Pavón) DC.). TYPE: Venezuela. Amazonas: in ripa fluminis Atabapo prope San Balthazar, *Humboldt & Bonpland s.n.* (holotype, P-HBK not seen).

Psychotria cardiomorpha subsp. **perpusilla** (Steyermark) C. M. Taylor & A. Pool, comb. nov. Basionym: *Psychotria cordifolia* subsp. *perpusilla* Steyermark, Mem. New York Bot. Gard. 23: 708. 1972, nom. illeg. TYPE: Guyana. Pirara, *Schomburgk 202* (holotype, P not seen).

Psychotria cordifolia HBK has been used by previous authors, but this name is an illegitimate later homonym. Although Dietrich's name was also illegitimate, it is validly published for the purposes of priority. The new name follows the original epithet in referring to the striking heart-shaped leaves of this species.

Psychotria ramiflora Rusby, Mem. New York Bot. Gard. 7: 277. 1927. TYPE: Bolivia. Beni: Rurrenabaque, *Cárdenas 1852* (holotype, NY microfiche seen, photo F).

Psychotria subpedicellata Steyermark, Mem. New York Bot. Gard. 23: 507. 1972. Syn. nov. TYPE: Peru. Loreto: Florida, Río Putumayo at mouth of Río Zubineta, *Klug 2019* (holotype, NY microfiche seen; isotype, F).

Examination of the descriptions and types of these names shows that they represent the same species. It is similar to *Psychotria limitanea* Standley and *P. subinundulata* Bentham, but is easily distinguished by its inflorescences about twice as long, 40–50 cm long. Steyermark apparently overlooked Rusby's name.

New Transfers from *Cephaëlis* to *Psychotria*

The justification for the inclusion of *Cephaëlis* in *Psychotria* subg. *Heteropsychotria* was presented in detail by Steyermark (1972) and has been summarized more recently by Taylor et al. (1991) and Taylor & Lorence (1992). *Cephaëlis* was segregated from *Psychotria* based primarily on the presence of relatively congested inflorescences and relatively large, often showy floral bracts, characteristics that Steyermark showed to be derived in parallel several times within subgenus *Heteropsychotria* and also to intergrade continuously with species included in *Psychotria*. This characteristic was not always interpreted similarly by different authors, and some species received names independently in both genera. *Cephaëlis* has been studied predominantly on a country or regional basis, and in several cases the same species has been described under different names in different countries.

Consequently, species of *Cephaëlis* cannot be confidently transferred into *Psychotria* without individual study. Careful study is important also because epithets in *Cephaëlis* are frequently precluded in *Psychotria*, and transfers require the creation of a new name in that large genus.

Several species described in *Cephaëlis* from Ecuador, Colombia, and Peru are here transferred to *Psychotria*, and the synonymy of some additional names is noted. This is not a comprehensive treatment of the species described in *Cephaëlis* from these countries, but an installment in the ongoing review of *Psychotria* from this area. Combinations, new names, and synonymizations previously published for neotropical species of *Cephaëlis* have been summarized by Andersson (1992).

Psychotria campyloneuroides (Standley) C. M. Taylor, comb. nov. Basionym: *Evea campyloneuroides* Standley, Contr. U.S. Natl. Herb. 18: 123. 1916. *Cephaëlis campyloneuroides* (Standley) Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 4: 294. 1929. TYPE: Colombia. Valle del Cauca: Córdoba, Dagua Valley, *Pittier 581* (holotype, US microfiche seen).

Psychotria calimensis Standley ex Steyermark, Acta Biol. Venez. 4: 96. 1964. Syn. nov. TYPE: Colombia. Valle del Cauca: Río Calima, región del Chocó, La Trojita, *Cuatrecasas 16298* (holotype, F; isotypes, US microfiche seen, VEN not seen).

The type collection of *Psychotria calimensis* has a markedly tripartite rather than capitate inflorescence, but recent additional collections show intermediate conditions, and these two species cannot be maintained.

Psychotria conephoroides (Rusby) C. M. Taylor, comb. nov. Basionym: *Cephaëlis conephoroides* Rusby, Bull. New York Bot. Gard. 4: 372. 1907. TYPE: Bolivia. Without locality or date, *Bang 2866* (holotype, NY not seen; isotypes, F not seen, GH not seen, MO, US microfiche seen).

Coffea umbellata Ruiz & Pavón, Fl. Peruv. 2: 64, t. 215, fig. a. 1799. Syn. nov. *Cephaëlis umbellata* (Ruiz & Pavón) Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 7: 301. 1931; not *Psychotria umbellata* Vellozo Concinci, 1825. TYPE: Peru. Huánuco: Cochero and Cinchao, *Ruiz & Pavón s.n.* (holotype, MA not seen; isotypes, B destroyed, photos (F neg. #845) F, MO).

Uragoga weberbaueri Krause, Bot. Jahrb. 40: 345. 1908. Syn. nov. Not *Psychotria weberbaueri* Standley, 1930. TYPE: Peru. San Martín: near Moyobamba, *Weberbauer 4540* (holotype, B destroyed, photo (F neg. #780) MO).

The name "*Coffea umbellata*" was recently treated as doubtful in generic placement (Brako & Zarucchi, 1993). With recent additional collections available, this species appears to be closely related to those placed in section *Pseudocephaëlis* Steyermark series *Appunianae* Steyermark. In particular it is similar to *Psychotria cordobensis* C. M. Taylor and *P. jervisei* (Standley) C. M. Taylor of Colombia and Ecuador; these all share thickly margined subcoriaceous leaves, umbelliform inflorescences with three to five capitula, and relatively large fruits with long calyx limbs, but can be separated by the venation pattern on the abaxial leaf surfaces, with *P. conephoroides* having numerous closely set secondary and intersecondary veins and strongly reticulate lesser venation, in contrast to 10–15 secondary veins with only one to three intersecondary veins developed between each pair of secondary veins and the lesser venation not visible in the other two species. All three of these species have been confused with *P. cuatrecasasii* (Steyermark) C. M. Taylor, which is found throughout this area. *Psychotria cuatrecasasii* differs from all three species by its single capitulum, but resembles *P. conephoroides* in its strongly reticulate leaf venation.

Psychotria cordobensis C. M. Taylor, nom. nov. Replaced name: *Cephaëlis crassifolia* Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 7: 77. 1930; not *Psychotria crassifolia* Miquel, Ann. Mus. Bot. Lugdano-Batavum 4: 205. 1869. TYPE: Colombia. Valle del Cauca: Córdoba, *Killip 5133* (holotype, US microfiche seen; isotypes, GH not seen, NY microfiche seen).

This species is known from Chocó and Valle provinces in Colombia at 0–1,200 m elevation. Its distinction from *Psychotria conephoroides* is discussed under that species. It can be separated from *P. jervisei* by its relatively small leaves with relatively short tips and usually only one intersecondary vein present between each pair of secondary veins, in contrast to the leaves larger with relatively long slender tips, usually three intersecondary veins present between each pair of secondary veins, and also a higher elevational range in *P. jervisei*.

Psychotria cuatrecasasii (Standley ex Steyermark) C. M. Taylor, comb. nov. Basionym: *Cephaëlis cuatrecasasii* Standley ex Steyermark, Acta Biol. Venezuela 4: 12, fig. 6. 1964. TYPE: Colombia. Norte de Santander: Cordillera Oriental, región del Sarare, hoya del Río Margua entre Campohermoso y Río Negro, *Cuatrecasas 12894* (holotype, US microfiche seen; isotype, F).

Cephaëlis macrocarpa Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 8: 64. 1930. Syn. nov. Not *Psychotria macrocarpa* Hooker f., Fl. Brit. India 3: 162. 1880. *Psychotria costanensis* Steyermark, Mem. New York Bot. Gard. 23: 658. 1972. TYPE: Venezuela. Aragua: prope Colonia Tovar, *Fendler 1990* (holotype, GH not seen; isotype, K not seen).

Steyermark (1974) described and illustrated *Psychotria costanensis* in detail; examination of the type specimen of *Cephaëlis cuatrecasasii* shows that these names are synonymous. This species is now known from Venezuela to northwestern Colombia, and south to Peru (*Schunke 199*, F).

Psychotria gentryi (Dwyer) C. M. Taylor, comb. nov. Basionym: *Cephaëlis gentryi* Dwyer, Selbyana 2: 57. 1977. TYPE: Ecuador. Los Ríos: Río Palenque Science Center, Km 56 of Quevedo–Santo Domingo road, *Dodson 5169* (holotype, MO; isotypes, RPSC not seen, SEL not seen, US not seen).

This species is similar to *Psychotria schunkeana* (Standley) C. M. Taylor (*Cephaëlis schunkeana* Standley) from Peru, particularly in the well-developed stipules and relatively large globose fruits with smooth pyrenes. This latter species is poorly known and may not be distinct, but its flowers have not been seen.

Psychotria jervisei (Standley) C. M. Taylor, comb. nov. Basionym: *Cephaëlis jervisei* Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 7: 79. 1930. TYPE: Colombia. Antioquia: *Jervise s.n.* (holotype, K not seen; isotype, F (type fragment)).

This species is known only from Antioquia Province in Colombia at 1,800–2,060 m elevation. Its distinction from *Psychotria cordobensis* is summarized under the discussion of that species. *Psychotria jervisei* is also similar to *P. transiens* Wernham, which can be separated by its well-developed reticulate tertiary venation on the abaxial leaf surfaces in contrast to smooth and generally invisible tertiary venation in *P. jervisei*.

Psychotria oleandrella (Standley) C. M. Taylor, Monogr. Syst. Bot. 45: 1255. 1993. *Cephaëlis oleandrella* Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 4: 334. 1929. TYPE: Peru. Junín: La Merced, 1,200 m, *Macbride 5635* (holotype, F; isotype, US microfiche seen).

Cephaëlis caudata Standley ex Steyermark, Acta Biol. Venezuela 4: 12. 1964. Syn. nov. TYPE: Colombia. Valle del Cauca: Río Calima, La Esperanza, 5–10 m, 6–7 Mar. 1944, *Cuatrecasas 16740* (holotype, US microfiche seen; isotypes, F, VEN not seen).

Examination of the types of these names shows that they are synonymous. This species is also known from Ecuador (*Mexia 6867*, MO) and Bolivia (*Gentry & Solomon 44521*, MO). It is similar to *Psychotria schunkei* C. M. Taylor (= *Cephaëlis killipii* Standley), from which it can be distinguished by its relatively narrower leaf blades with unusually narrow long tips.

Psychotria ostreophora (Wernham) C. M. Taylor, comb. nov. Basionym: *Cephaëlis ostreophora* Wernham, J. Bot. 55: 284. 1917. TYPE: Colombia. Bogotá: Servitá y Villavicencio, *Triana s. n.* (holotype, BM not seen; isotype, F).

Cephaëlis salicifolia Roemer & Schultes, Syst. Veg. 5: 214. 1819. Syn. nov. Not *Psychotria salicifolia* HBK, 1819, not *Psychotria salicifolia* Roemer & Schultes, 1819, not *Psychotria salicifolia* Hemsley, 1881. TYPE: Venezuela. Sucre: Cocollar, *Humboldt & Bonpland s.n.* (holotype, B-WILLD, photo (neg. #766) F; isotype, F (fragment)).

Cephaëlis acreana K. Krause, Notizbl. Bot. Gart. Berlin-Dahlem 6: 211–212. 1914. Syn. nov. Not *Psychotria acreana* Krause, 1914. TYPE: Peru. Madre de Dios: Río Acre, Alto Acre bei Seringal Auristella, Mar. 1911, *Ule 9856* (holotype, B destroyed, photo (F neg. #713) F).

Evea lucentifolia Blake, Contr. U.S. Natl. Herb. 20: 532, fig. 42. 1924. Syn. nov. *Psychotria lucentifolia* (Blake) Steyermark, Mem. New York Bot. Gard. 23: 610. 1972. TYPE: Venezuela. Carabobo: Guaremales, road from Puerto Cabello to San Felipe, *Pit-*

tier 8911 (holotype, US not seen; isotype, NY microfiche seen).

Cephaëlis setifera Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 7: 80. 1930. Syn. nov. TYPE: Colombia. Cauca: highlands of Popayán, *Lehmann BT-940* (holotype, F, photo (F neg. #52039) F; isotypes, F (fragment), GH not seen, K not seen). Standley noted the type number as "*970*" in the original publication, but the only material of this species found at F was *Lehmann BT-940*, which was annotated by Standley and agrees in all other ways with the collection data he cited; the citation of "970" was apparently a typographical error.

Cephaëlis bella Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 8: 372. 1931. Syn. nov. *Psychotria vasquezii* C. M. Taylor, Monogr. Syst. Bot. 45: 1256. 1993. TYPE: Peru. Loreto: Puerto Arturo, Yurimaguas, lower Río Huallaga, *Williams 5207* (holotype, F, photo (F neg. #52044) F).

Cephaëlis umbriana Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 11: 192. 1936. Syn. nov. *Psychotria umbriana* (Standley) Steyermark, Mem. New York Bot. Gard. 23: 637. 1972. TYPE: Colombia. Putumayo: Umbría, 00°54′N, 76°10′W, *G. Klug 1718* (holotype, F, photo (F neg. #52033) F).

Examination of the types of these names show that they are synonymous with *Psychotria lucentifolia* as described and illustrated by Steyermark (1972, 1974). It is distinguished by its stipules, with the awns attached below the apex of the truncate sheath, the leaves with their bases obtuse to rounded or subcordate, and its pedunculate capitate inflorescences surrounded by 3–4 lanceolate to ovate bracts. Steyermark (1972) noted that leaf shape is variable. Several of these names are based on this variability, while others were described from areas far from where this species was well known, and previously published names were apparently overlooked. The identity of *Cephaëlis ostreophora* in particular was not clear for many years, and was considered by Sandwith (1949) to have been misinterpreted by Standley.

Psychotria timbiquensis (Standley) C. M. Taylor, comb. nov. Basionym: *Cephaëlis timbiquensis* Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 7: 81. 1930. TYPE: Colombia. Cauca: Río Timbiquí, *Lehmann 8991* (holotype, K not seen; isotypes, F (type fragment), P not seen).

This species has been confused with *Psychotria humboldtiana* (Chamisso) Mueller Argoviensis; it can be separated by its relatively dull and thin-textured leaves and inflorescences with the capitula borne in a pyramidal raceme, in contrast to very shiny coriaceous leaves and the capitula in an umbelliform arrangement in *P. humboldtiana*.

Acknowledgments. I thank the curator of F for making specimens available, and D. Lorence and J. Zarucchi for helpful comments.

Literature Cited

Andersson, L. 1992. A provisional checklist of neotropical Rubiaceae. Scripta Botanica Belgica 1: 1–199.

Brako, L. & J. Zarucchi. 1993. Catalogue of the Flowering Plants and Gymnosperms of Peru/Catálogo de las Angiospermas y Gimnospermas del Perú. Monogr. Syst. Bot. Missouri Bot. Gard. 45.

Hamilton, C. 1989. A revision of Mesoamerican *Psychotria* subg. *Psychotria* (Rubiaceae). Part I: Introduction and species 1–16. Ann. Missouri Bot. Gard. 76: 67–111.

Sandwith, N. Y. 1949. Contributions to the flora of tropical America: XLIX. Kew Bull. 1949: 253–264.

Steyermark, J. A. 1972. *Psychotria*. *In:* B. M. Maguire & Collaborators, Flora of the Guayana Highlands. Mem. New York Bot. Gard. 23: 406–717.

———. 1974. Rubiaceae: *Psychotria*. *In*: T. Lasser (editor), Flora de Venezuela 9(3): 1111–1683. Instituto Botánico, Dirección de Recursos Naturales Renovables, Ministerio de Agricultura y Cría. Caracas, Venezuela.

Taylor, C. M. & D. H. Lorence. 1992. Notes on *Psychotria* subgenus *Heteropsychotria* (Rubiaceae: Psychotrieae) in Mexico and northern Central America. Novon 2: 259–266.

———, B. E. Hammel & W. Burger. 1991. New species, combinations, and records in Rubiaceae from the La Selva Biological Station, Costa Rica. Selbyana 12: 134–140.

A New Species of *Roegneria* (Poaceae: Triticeae) from Tibet

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ABSTRACT. *Roegneria tenuispica* is described and illustrated, and its chromosome number, $2n = 28$, is reported.

The new species was discovered during an expedition to Tibet in 1989 to collect germplasm of various members of the tribe Triticeae. Clumps of this plant were transplanted to the Triticeae Institute in order to obtain further supplies of seed material.

Roegneria tenuispica J. L. Yang & Y. H. Zhou, sp. nov. TYPE: China. Xizang (Tibet): Eluo, Changdu to Ruiwuqi highway 22 km, alt. 3,580 m, 25 Sep. 1989, *J. L. Yang & B. R. Lu 890955* (holotype, Sichuan Agricultural University Triticeae Institute). Figure 1.

Herba perennis caespitosa. Culmi 35–75 cm alti, glabri. Foliorum laminae 15–20 cm longae, 3–4 mm latae, superne villosae, inferne scabrae. Spicae 9.2–10.5 cm longae; spiculae 8–11, 1.3–1.6 cm longae; glumae oblongo-lanceolatae, apice acuminatae, primae 5–6.5 mm longae, secundae 6.5–7.5 mm longae, hirsutis; lemmata oblongo-lanceolata, 6.5–8 mm longa, inferne dense pubescentia, superne scabro-ciliata, arista 1–2 cm longa; paleae lemmate breviores vel eas aequantes. Caryopsides oblongae, ca. 5.5 × 1.5 mm, apice dense albo-hispidulae.

Herbs rhizomatous perennial. Culm loosely tufted, lax, caespitose, erect, 35–75 cm tall, ca. 0.5–1 mm diam., glabrous; nodes 4 or 5, puberulent. Leaves with sheaths longer than or equal to internodes, villose with hairs to ca. 1 mm, the persistent basal part often lacerate, fibrous; ligule hyaline-membranous, truncate, premorse, ca. 0.5 mm long; leaf blades green, 15–20 cm long, 3–4 mm wide, erect, plane or involute subulate, adaxially densely villose, abaxially scabrous. Spikes 9.2–10.5 cm long (excluding awn), thin, erect or slightly nodding; lower rachis internodes 1.2–1.5 cm long, the upper 0.8–1.2 cm, glabrous on the back, hispid ciliate on the edges; rachis nodes densely pubescent; spikelets 8–11, solitary, 1.3–1.6 cm long (excluding awn), with 4–9 florets; rachilla internodes 1–1.5 mm long, densely puberulent; glumes oblong-lanceolate, acuminate, with a mucro 0.5–1 mm long, herbaceous, membranous along the margin; first glume 5–6.5 mm long (excluding awn), 3–4-nerved; second glume 6.5–7.5 mm long, 4–5-nerved, hirsute; lemmas oblong-lanceolate, 6.5–8 mm long (excluding awn), the lower part densely pubescent, the upper scabrous-ciliate, distinctly 5-nerved; first lemma 7.5–8 mm long, with an awn 1–2 cm long; callus obtuse, densely puberulent laterally with hairs ca. 0.6–0.8 mm long; palea shorter than or subequal to the lemma, with a rounded-obtuse and a slightly concave apex, the keels ciliate in the upper ½–¾, hairy between the keels. Anthers yellow, 2–2.5 mm long. Caryopsis brown, oblong, ca. 5.5 × 1.5 mm, densely white hispidulous, adherent to the lemma and palea. Flowering July to August.

Roegneria tenuispica is readily distinguished from the closely related *R. pendulina* Nevski by its shorter culms, hairy leaves, narrower (3–4 mm) leaf blades, shorter spikes (9.2–10.5 cm long), and shorter glumes (5–6.5 mm long) and lemmas (6.5–8 mm long). *Roegneria pendulina* has culms to 110 cm tall, scabrous leaves, broader (6–10 mm) leaf blades, spikes 15–22 cm long, glumes 6–9 mm long, and lemmas 8–10 mm long.

The chromosome count $2n = 28$ of *Roegneria tenuispica* is based on the observation of 50 cells, and the karyotype shown in Figure 2a is rearranged in Figure 2b. The karyotype of this species includes a pair of satellites on what is designated here as chromosome 14. This karyotype is similar to that of *R. dolichathera* Keng (Zhou et al., 1993), which contains the SY genomes (Lu & Salomon, 1992).

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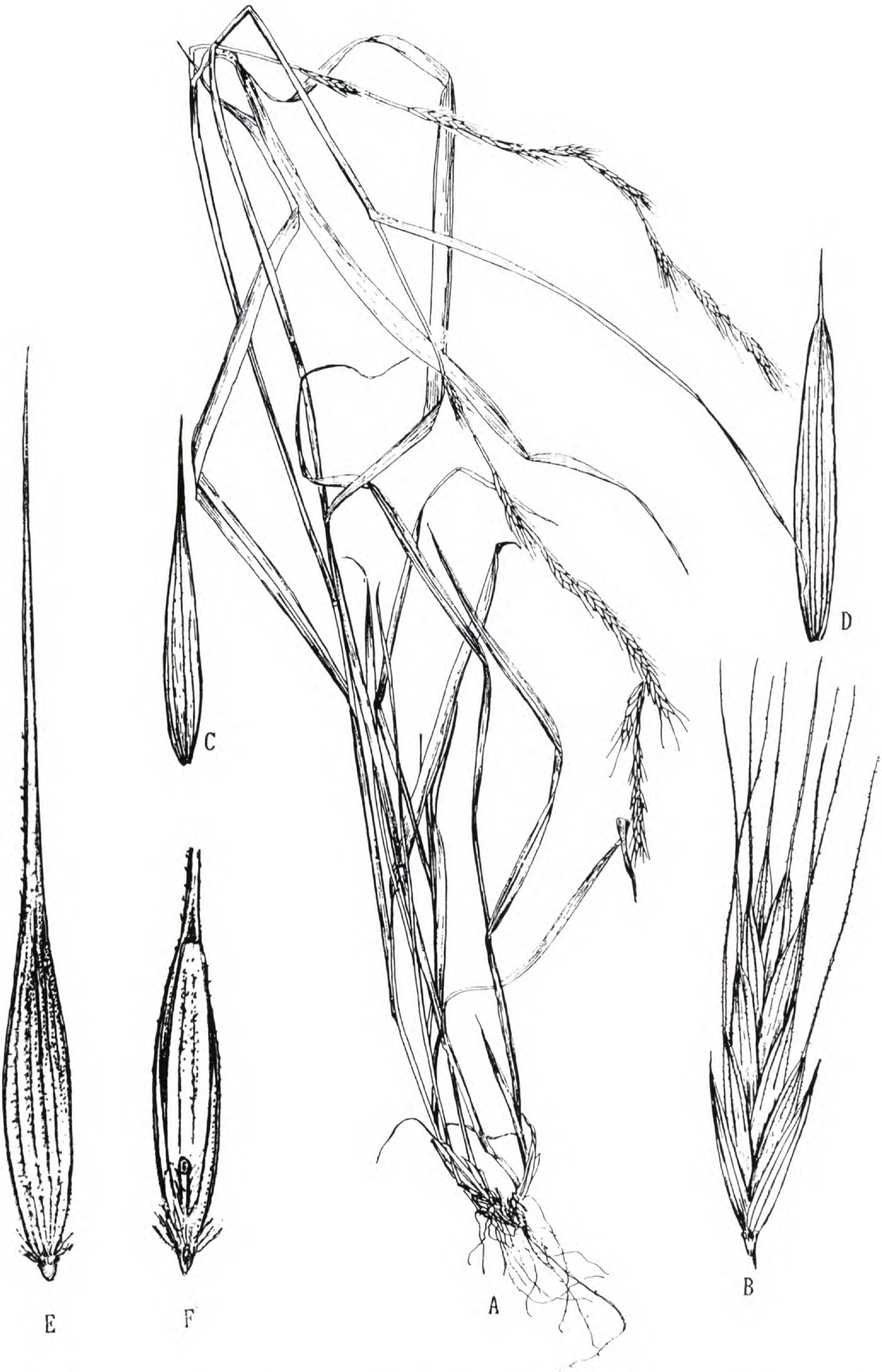

Figure 1. *Roegneria tenuispica* J. L. Yang & Y. H. Zhou. —A. Plant. —B. Spikelet. —C. First glume. —D. Second glume. —E. Abaxial view of a floret. —F. Adaxial view of a floret.

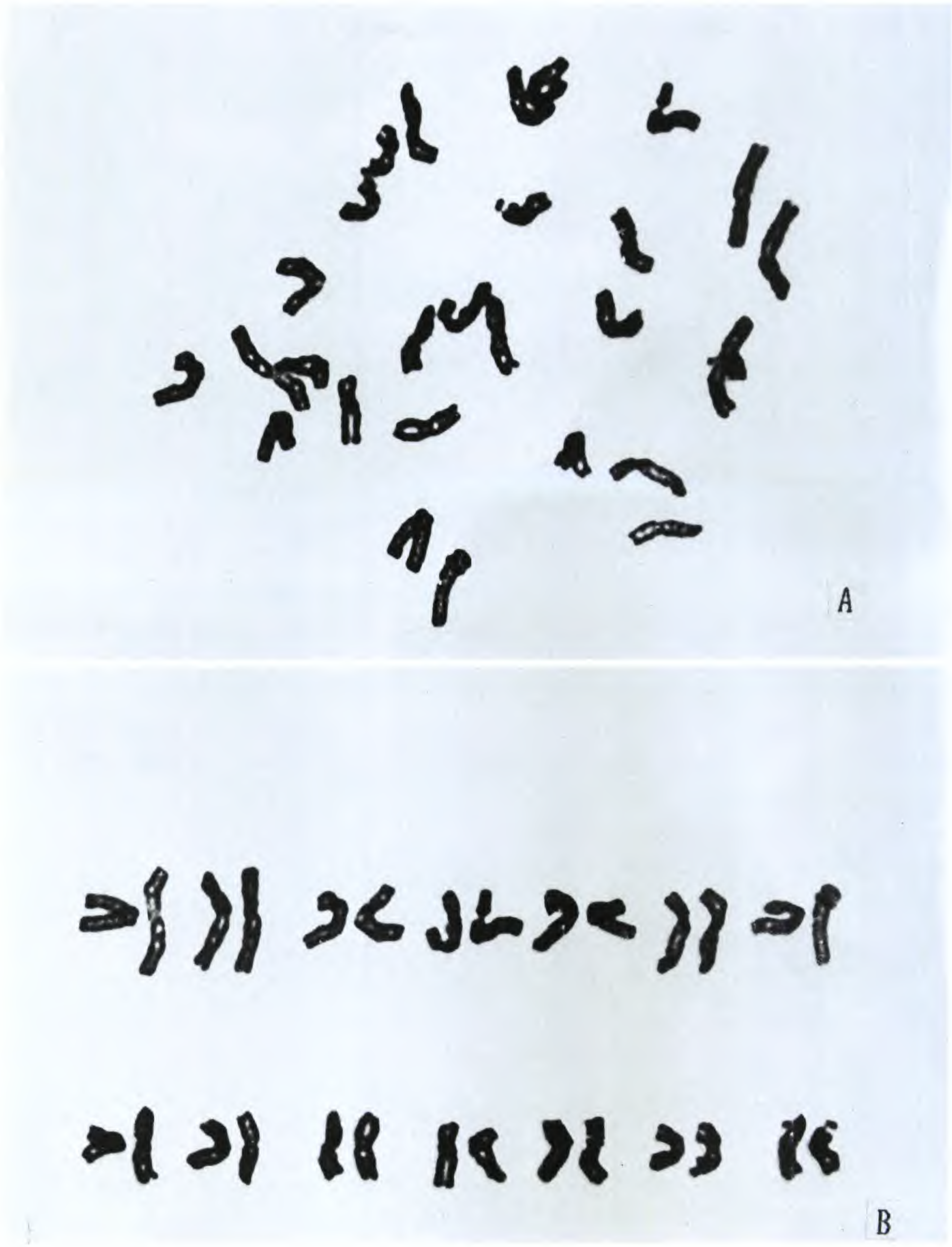

Figure 2. Karyotype of *Roegneria tenuispica*. —A. Metaphase cell of root tip showing $2n = 28$. —B. Karyotype from A, with a pair of satellites on chromosome 14.

Literature Cited

Lu, B. R. & B. Salomon. 1992. Differentiation genomes in Asiatic *Elymus*. Hereditas 116: 121–126.

Zhou, Y. H., G. L. Sun & J. L. Yang. 1993. Study on karyotypes of 5 species of *Roegneria*. Guihaia 13(2): 149–155.

Roegneria tridentata, a New Species of Triticeae (Poaceae) from Qinghai, China

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ABSTRACT. *Roegneria tridentata* is described and illustrated, and its karyotype is characterized.

Roegneria tridentata was discovered during our fieldwork in 1992 in the Qi-lain Mt. on the northern border of Qinghai province, China. A few weeks later, it was collected in the A'Nyemaqen Mt. The two localities are more than 400 km apart.

Roegneria tridentata Yen & J. L. Yang, sp. nov. TYPE: China. Qinghai: Wenquan, Xinhai, km 337 on highway 214, rocky slope, 3,750 m, 19 Sep. 1992, *J. L. Yang et al. no. 9202014* (holotype, Sichuan Agricultural University Triticeae Institute; isotype, MO). Figure 1.

Herba perennis caespitosa. Culmi 42–65 cm alti. Laminae 5–7 cm longae, ca. 2 mm latae, inferne glabrae, superne adpressae dense pubescentibus in projectis nervis. Spicae 5–11.5 cm longae, spiculae solitariae, 10–13 mm longae, 4- vel 5-florae; glumae oblongae vel oblongo-ellipticae, primae 4–5 mm longae, secundae 5–6.5 mm longae, glabrae; lemmata oblongo-lanceolata, (7–)8–9 mm longa, primo 9 mm longo, 5-nervia, apicies truncati et tridentati, dentes ca. 0.5 mm longi, saepe nervo medio prominente in 0.5–1 mm longo mucronem producta; paleae apice truncatae, inter carinas scabrae, ad carinas ⅓–½ superiore setuloso-ciliata.

Herbs perennial. Culms caespitose, erect or slightly procumbent, geniculate at base, 42–65 cm tall, ca. 1.5–2 mm diam., with 2 or 3 nodes, smooth, glabrous. Leaf sheaths glabrous, persistent basal ones 2–4 cm long; ligule scarious, truncate premorse, ca. 0.5 mm long; blades involute or subinvolute, 5–7 cm long, ca. 2 mm broad; tillers narrowly linear, usually to 20 cm long, glabrous beneath, appressed densely pubescent on projecting veins of upper surface. Spikes erect, purple or greenish purple, 5–11.5 cm long, ca. 5 mm broad, with 6–14 spikelets; upper rachis internodes 5–10 mm long, the lower 15–20 mm, both glabrous, hirsute on angles; spikelets solitary, 10–13 mm long, ca. 2 mm broad, with 4 or 5 florets; rachilla internodes appressed puberulent, 1.5–2 mm long; glumes oblong or oblong-elliptic, unequal, apically rounded-obtuse, rarely acute, slightly oblique; first glume 4–5 mm long; second glume 5–6.5 mm long, with 3(–5) projected veins, glabrous, sometimes sparsely short spinulose on veins; lemmas oblong-lanceolate, (7–)8–9 mm long, 5-veined, appressed white pubescent on lateral and lower parts, apically truncate and 3-toothed, the teeth ca. 0.5 mm long, sometimes midvein extending into a mucro to 0.5–1 mm long; callus obtuse, puberulent on the sides; paleas shorter to longer than lemmas, apically truncate, scabrous between keels, setulous-ciliate on upper ⅓–½ of keel; anthers black, ca. 2 mm long. Chromosome number: $2n = 6x = 42$ (Fig. 2).

The characteristic awnless, 3-toothed lemmas (Fig. 1c) readily distinguish the species from other members of *Roegneria* C. Koch and from members of related genera.

Root tips of young seedlings (ca. 2.5 cm long) were collected at 10:00 A.M. and placed in water at 3–4°C for 24 hours. They were transferred to 20 ml 0.01% colchicine solution with 5 drops of dimethyl-sulfoxide and kept for 3 hours before fixation in Carnoy's fluid for 24 hours. Root tip cells were dissociated by 1N HCl for 8 minutes at 60°C, and slides were prepared by the standard acetocarmine squash method. Chromosomes were studied at diakinesis, photographs were taken by computer-

→

Figure 1. *Roegneria tridentata* Yen & J. L. Yang (holotype). —A. Plant. —B. Dorsal view of a floret showing 3-toothed apex of lemma and tip of longer palea. —C. Dorsal view of lemma. —D. Ventral view of floret. —E. Lodicule. —F. Dorsal view of caryopsis. —G. Ovary and stigma. —H. Stamen. —I. First glume. —J. Second glume. —K. Spikelet.

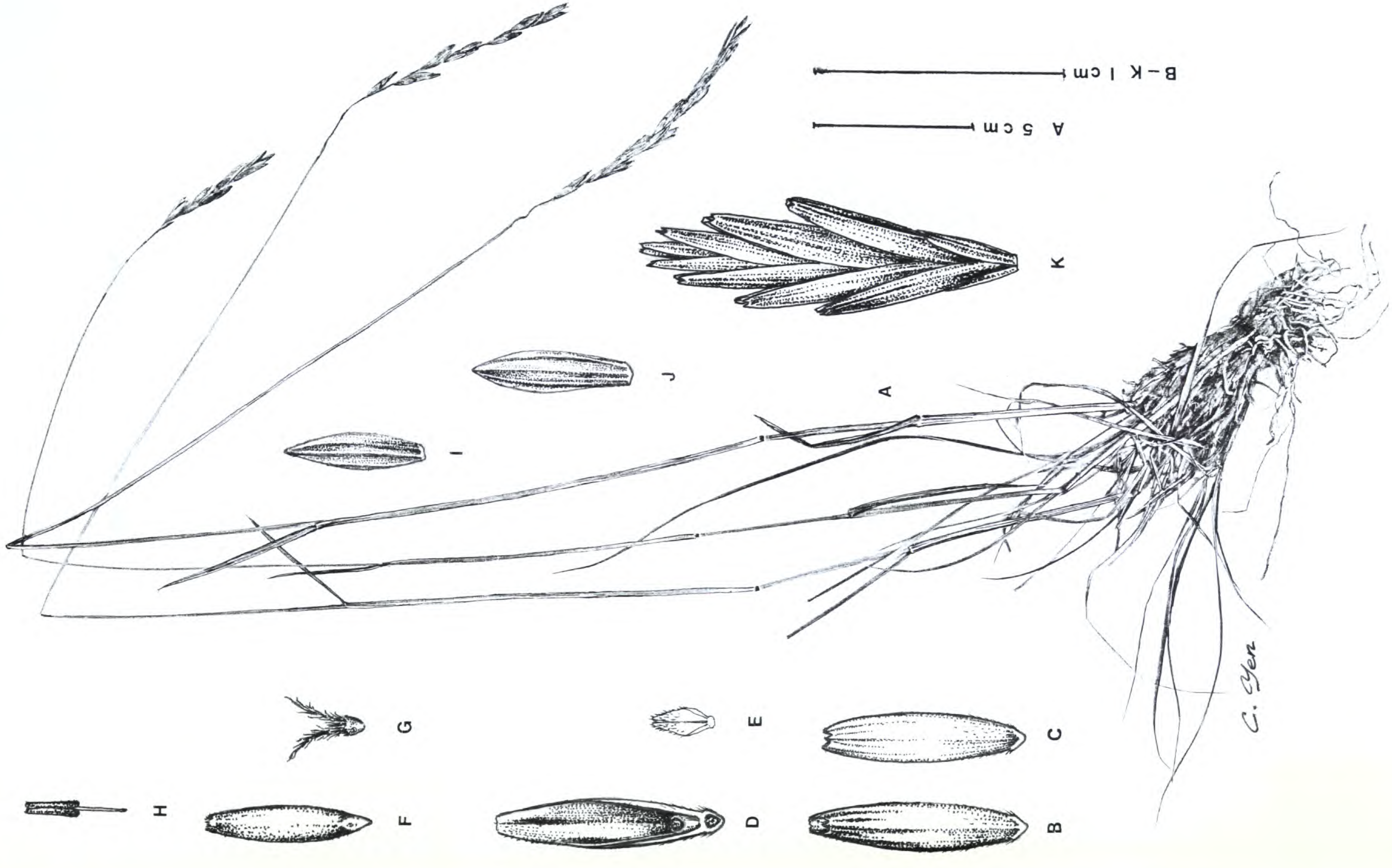
B–K 1 cm
A 5 cm
K
J
I
A
G
E
C
H
F
D
B
C. Yen

Figure 2. Karyotype of *Roegneria tridentata* Yen & J. L. Yang. —A. Karyotype of somatic cell. —B. Same, karyotype with chromosomes rearranged by a MacIntosh Quadra 700 computer. —C. Same, but chromosomes straightened by MacIntosh Quadra 700 computer. —D. Idiogram prepared from C.

controlled Olympus system PM-10AD, and chromosome length was measured by a MacIntosh Quadra 700 computer.

Roegneria tridentata is a hexaploid, $2n = 6x = 42$. Its karyotype includes two pairs of satellite chromosomes. On the basis of the comparative arm length of satellite chromosomes, the species belongs to the *Roegneria* type. Its genomic constitution is apparently different from that of *Elymus* and *Kengyilia*. Detailed genome analysis is now in progress. The karyotype is similar to that of *R. tsukushiensis* (Honda) Ohwi, which was documented earlier (Lu et al., 1988). Chromosome 40 has a large satellite, and chromosome 42 has a very short arm connected with a small satellite. This is the typical karyotype of the Y genome. The other two genomes may be the S and H observed in *R. tsukushiensis*, but further study is needed to elucidate that.

Paratype. CHINA. **Qinghai:** 152 km from Qilian to Yienuguo, Sunan County, 3,100 m, 31 Aug. 1992, *J. L. Yang et al. 9202001* (Sichuan Agricultural University Triticeae Institute).

Acknowledgments. We are grateful to Ihsan Al-Shehbaz for help in the preparation of the manuscript.

Literature Cited

Lu, B. R., C. Yen & J. L. Yang. 1988. The studies of morphological variation and karyotype analysis on three *Roegneria* species. Acta Bot. Yunnan. 10: 139–146.

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Porotrichum tenuinerve (Musci: Neckeraceae), A New Species from Honduras, with a Provisional Key to *Porotrichum* in Central America

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ABSTRACT. *Porotrichum tenuinerve* sp. nov. differs from other species in the genus by its gonioautoicous condition and short, frequently double costae. A key to the species of *Porotrichum* in Central America is given, which incorporates synonymy proposed by Sastre-de Jesús and Smith. *Porotrichum mutabile* Hampe, *P. insularum* Mitten, and *P. plagiorhynchum* Renauld & Cardot are tentatively placed in the synonymy of *Porotrichum longirostre* (Hooker) Mitten; *Homaliodendron piniforme* (Bridel) Enroth is reported for the first time from Central America (Panama).

Porotrichum is a prevalent moss genus in Central American cloud forests, where it grows on tree trunks and branches, boulders and rock outcrops. It has a dendroid habit with erect stems arising along well-developed stolons. *Porotrichum* species may have up to five different leaf morphologies: stolon, stipe, stem, branch, and flagellate branch leaves. Taxonomic characters of specific importance are found in the relative size of the plants and leaves, leaf cell shape, leaf margin dentation, and leaf shape. Due in part to the variability of its leaf morphologies, the taxonomy of the group is unsettled. There appear to be many more names in the literature than species in nature. Regardless of its overdescribed status, the genus still harbors novelties, as can be seen in the following Honduran collection of *Porotrichum*. This moss is strikingly different from all other Latin American species of the genus and represents a species new to science.

Porotrichum tenuinerve B. Allen, sp. nov. TYPE: Honduras. Lempira: Montaña de Celaque, trail from Camp Don Tomas to first ridge, 14°34′N, 88°39′W, *Allen 11338* (holotype, MO; isotypes, NY, TEFH). Figures 1–10.

A *P. longirostri* costis brevibus saepe duplicibus et statu monoico sexuali differt.

Plants medium size, 3–6 cm high, yellow-green to green, dendroid and frondose, irregularly pinnate, flagellate branches sometimes formed distally. Stolons creeping with reduced leaves and abundant rhizoids. Stipes 10–15 mm long, in cross section with epidermis of 2–3 layers of small, thick-walled, red cells and cortex of 6–9 outer layers of somewhat larger, thick-walled, yellow cells, 7–10 inner layers of larger, firm-walled, orange cells, central strand well developed, sometimes with a dense, black discoloration. Stem leaves complanate, smooth when dry, asymmetric, oblong-cultriform, 2–3 mm long, 0.7–1.0 mm wide, broadly acute, broadly apiculate, margins serrate or dentate at apex, teeth sometimes of 2–3 cells, serrulate to midleaf; costa very short and double or single and reaching ⅓ leaf length; upper cells long-rhomboidal, 30–60 μm long, 7–10 μm wide, median and basal cells linear-fusiform to vermicular, 50–90 μm long, 6–10 μm wide, alar cells shorter, often porose. Branch leaves variable, identical to stem leaves or oval below and spathulate above with intermediate forms common. Axillary hairs 4–6 cells long, 1–2 short, quadrate, reddish, firm-walled basal cells and 3–4 elongate, hyaline, thin-walled cells. Gonioautoicous. Setae 15–20 mm long, reddish yellow. Capsules erect to suberect, ovoid-cylindrical, somewhat constricted at base, 1.5–2.0 mm long, stomata present at base; opercula conic-rostrate, 1.5 mm long. Exostome teeth linear, 0.6–0.8 mm long, 0.08 mm wide at base, dorsal surface striate-papillose below, vermiculate-papillose at middle, lightly papillose above, trabeculae and median line thin below, thickened in the upper ⅓; ventral surface with projecting trabeculae, lightly papillose. Endostome lightly papillose; basal membrane 0.2 mm long, processes 0.4–0.5 mm long,

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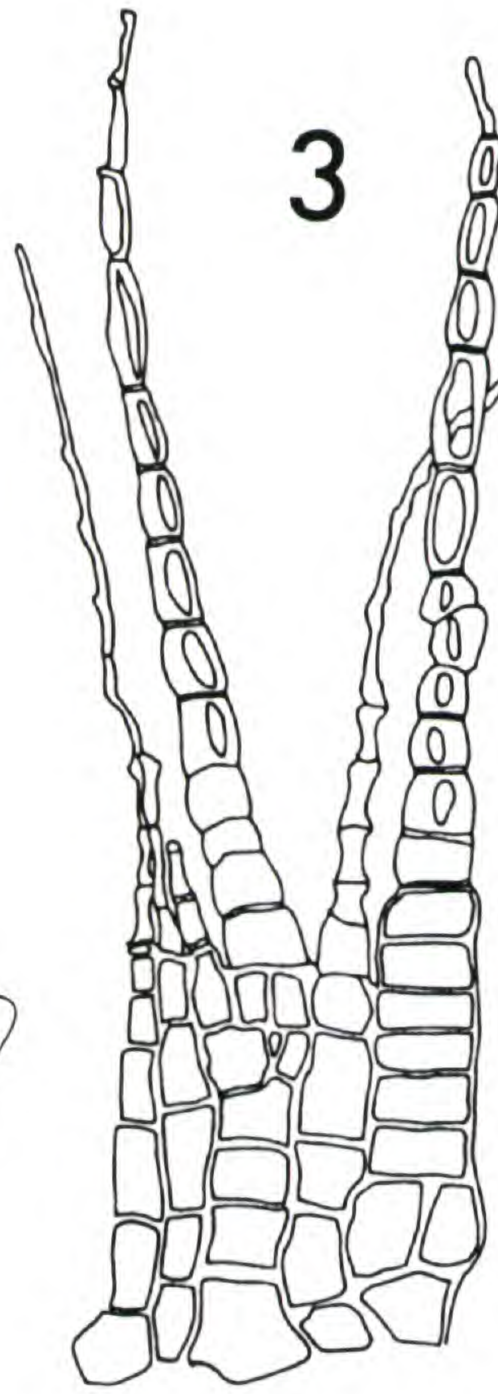
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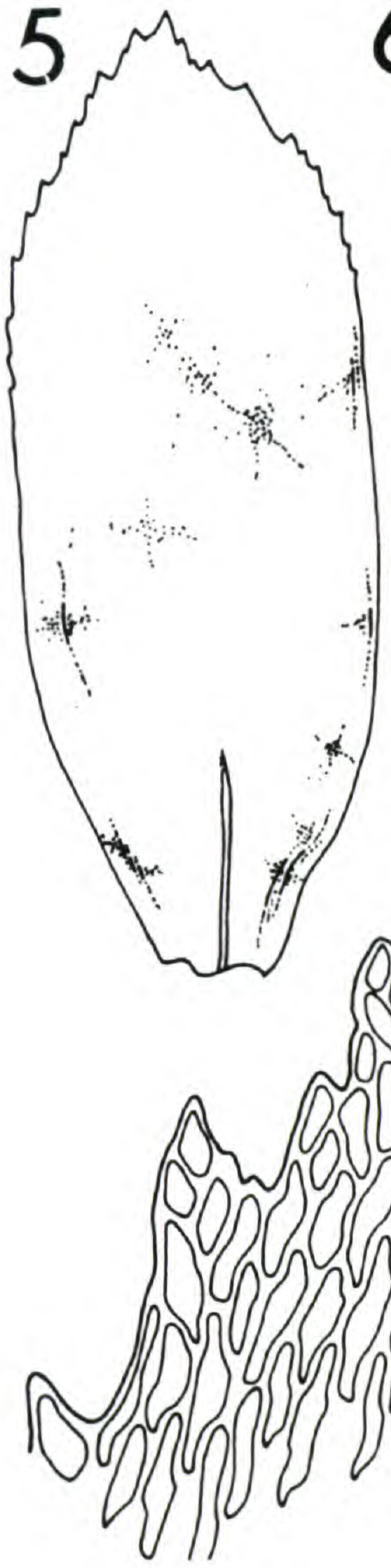
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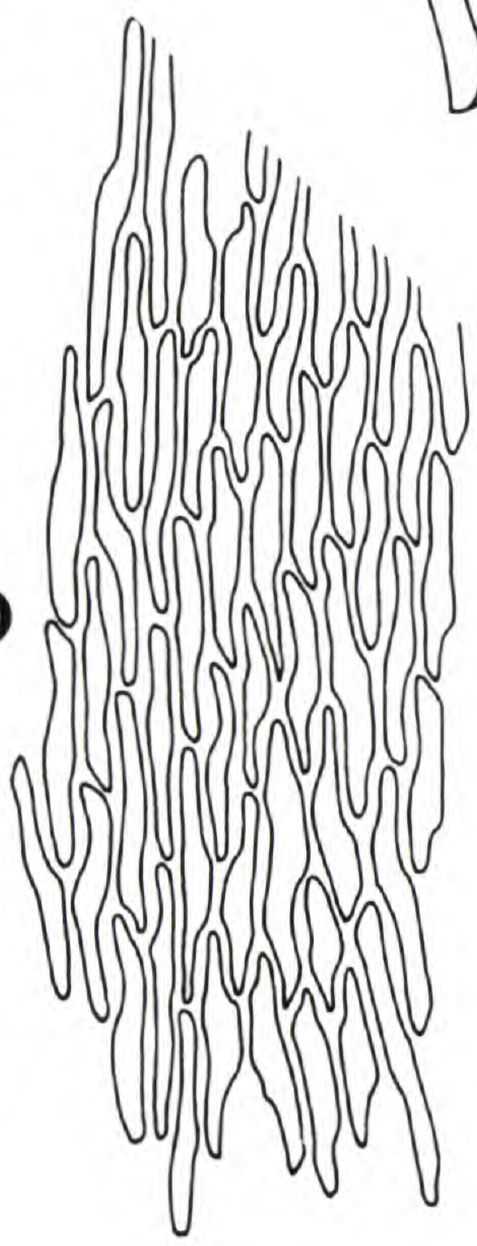
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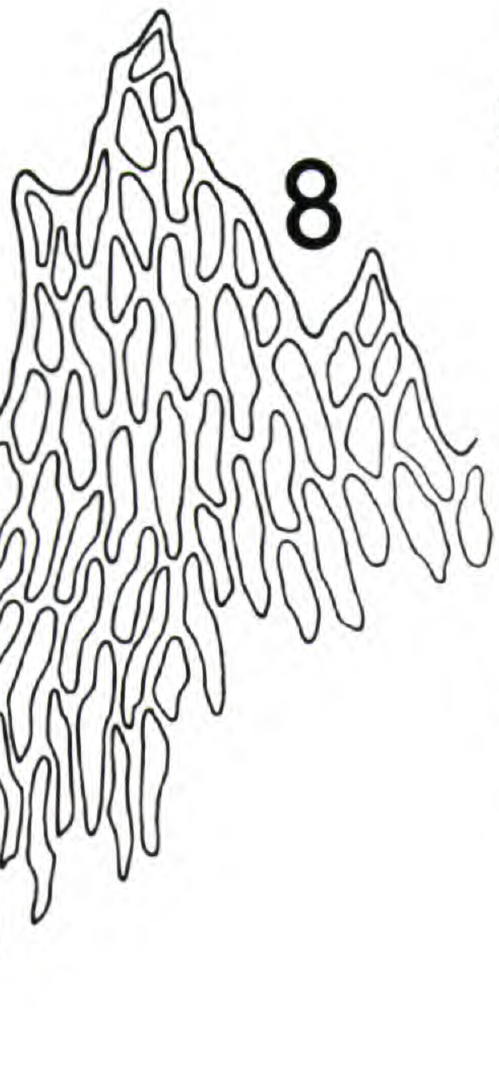
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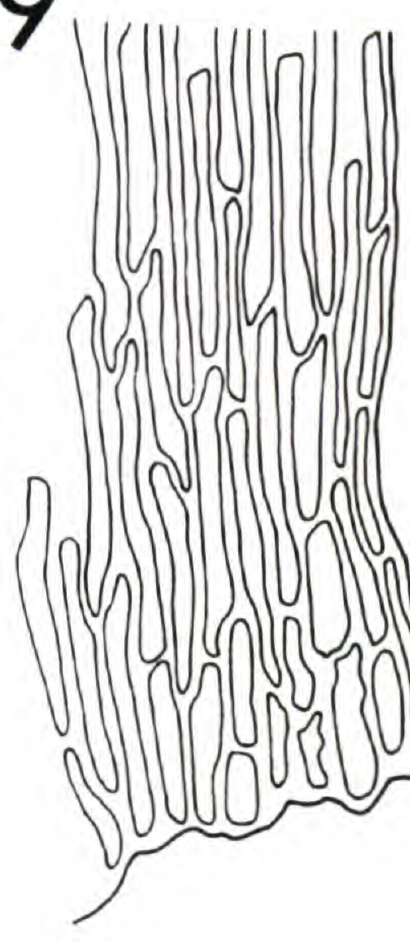
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broadly perforate, cilia 1–3, 0.30–0.35 mm long. Calyptra tubular-cucullate 2–3 mm long, smooth. Spores spherical, lightly papillose, 14–20 μm.

Habitat. At base of twigs and on root at base of massive tree; 2,170–2,180 m.

Porotrichum tenuinerve is similar to *P. longirostre* in size and aspect, and in its tendency to have multicellular, dentate teeth on the leaf margins. It differs from all members of *Porotrichum* in having a short costa (not more than ⅓ the leaf length) that may be double or single, and a gonioautoicous sexual condition. Within the Neckeraceae, *Porotrichum* is characterized by its slender, single costa that reaches from ½ to ¾ the leaf length and by its dioicous condition. The short costa in *P. tenuinerve* seems a striking exception, but it actually only represents the end of a morphological continuum. The presence of a gonioautoicous species in an otherwise dioicous genus would seem significant, but the importance of this feature is minimized by the report (Fleischer, 1908) of autoicous species in the closely related genus *Porothamnium*.

Paratype. HONDURAS. **Lempira:** same locality as holotype, *Allen 11334* (MO, TEFH).

The following key to the *Porotrichum* species in Central America is based on my examination of recently collected material. It is intended as a preliminary, working account and incorporates synonymy proposed by Sastre-de Jesús (1987) and Smith (1994). In addition, based upon my examination of herbarium material, *Porotrichum mutabile* Hampe, *P. insularum* Mitten, and *P. plagiorhynchum* Renauld & Cardot are tentatively placed in the synonymy of *Porotrichum longirostre* (Hooker) Mitten.

Enroth (1990) transferred *Porotrichum piniforme* (Bridel) Mitten to *Homaliodendron* because, among other reasons, it lacks a stem central strand. *Homaliodendron piniforme* (Bridel) Enroth has never been reported from Central America, but the species has recently been collected in Panama (Bocas del Toro: *Allen 5605* (MO, PMA)).

Key to the Species of *Porotrichum* in Central America

1a. Branch leaf margins dentate by multicellular teeth 2
1b. Branch leaf margins serrate by unicellular teeth 3
2a. Costae short and double or single and ⅓ the leaf length, plants gonioautoicous ..... *P. tenuinerve* Allen
2b. Costae single, ½–¾ the leaf length, plants dioicous ..... *P. longirostre* (Hooker) Mitten
3a. Stem leaves to 1 mm long, branch leaves to 0.6 mm long ..... *P. brevifolium* Bartram
3b. Stem leaves greater than 1.5 mm long, branch leaves greater than 0.6 mm long 4
4a. Costae short and double or single and ⅓ the leaf length, plants gonioautoicous ..... *P. tenuinerve* Allen
4b. Costae single, ½–¾ the leaf length, plants dioicous 5
5a. Branch leaves tumid, concave 6
5b. Branch leaves complanate, flattened 7
6a. Upper leaf margins broadly inflexed, serrulate; upper leaf cells short-rhomboidal ..... *P. lindigii* (Hampe) Mitten
6b. Upper leaf margins plane or erect, sharply denticulate; upper leaf cells hexagonal, subquadrate, or rhombic ..... *P. guatemalense* Bartram
7a. Plants less than 5 cm high, stipe leaves recurved, branch leaves plicate ..... *P. substriatum* (Hampe) Mitten
7b. Plants 6–10 cm high, stipe leaves spreading to erect, branch leaves plicate or smooth 8
8a. Branch leaves lanceolate, narrowly acute ..... *P. longirostre* (Hooker) Mitten
8b. Branch leaves obovate, obtuse 9
9a. Branch leaves serrate only in upper half ..... *P. korthalsianum* (Dozy & Molkenboer) Mitten
9b. Branch leaves serrate nearly to base ..... *P. lancifrons* (Hampe) Mitten

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Literature Cited

Enroth, J. 1990. Notes on the Neckeraceae (Musci) 3–7. *Homaliodendron piniforme* comb. nov. and new

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Figures 1–10. *Porotrichum tenuinerve* B. Allen. —1. Habit. —2, 5. Branch leaves. —3. Endostome basal membrane, segments, and cilia, ventral (inner) surface. —4. Exostome tooth, dorsal (outer) surface. —6. Median leaf cells. —7. Capsule and operculum. —8. Leaf apex and upper leaf cells. —9. Leaf alar region. —10. Stem leaf. Scales in mm: top = 6.25 (1); subtop = 0.5 (7); middle = 0.1 (3, 4); subbottom = 0.5 (2, 5, 10); bottom = 0.05 (6, 8, 9). All drawings from the holotype. (Drawn by the author.)

synonyms in *Porotrichum*, *Himantocladium* and *Neolindbergia*. Nova Hedwigia 51: 551–559.

Fleischer, M. 1908. Die Musci der Flora von Buitenzorg, Vol. 3. Brill, Leiden.

Sastre-de Jesús, I. 1987. A revision of the Neckeraceae Schimp. and the Thamnobryaceae Marg. & Dur. in the Neotropics. Ph.D. Dissertation, City University of New York, New York.

Smith, D. K. 1994. Neckeraceae. Pp. 741–765 *in* A. J. Sharp, H. Crum & P. M. Eckel (editors), Moss Flora of Mexico. Mem. New York Bot. Gard. 69.

A New *Bonamia* (Convolvulaceae) from Nicaragua

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ABSTRACT. A new species of *Bonamia* has been discovered in the Department of Chontales in Nicaragua. *Bonamia douglasii* is described and compared with other large-sepaled species in the world. This species differs from the other Central and North American members of the genus in being a woody climber with two cordate outer sepals larger than the inner three.

RESUMEN. Una especie nueva de *Bonamia* se ha descubierto en el Departamento de Chontales de Nicaragua. *Bonamia douglasii* se describe y se contrasta con las otras mundiales del género con sepalos grandes. Esta especie se difiere de las demás de la América Central y Norte en que es una trepadora leñosa con los dos sépalos exteriores mayores que los interiores.

Myint & Ward (1968) recognized 23 neotropical species in *Bonamia* A. Thouars. Revision of the genus based on the more abundant material now available indicates that 18 of the species they studied should be retained (Austin & Staples, unpublished data). However, exploration in the American tropics since the early 1970s has resulted in the addition of *B. apurensis* D. F. Austin (1982a), *B. mexicana* J. A. McDonald (1987), and *B. leonii* A. H. Gentry & D. F. Austin (1988). During study of specimens for the *Flora de Nicaragua*, I encountered yet another *Bonamia* that previously had not been recognized. Because the specimen represents a unique, locally endemic taxon, it is presented as new. The following, along with the three species recently described, brings the current neotropical generic total to 22.

Bonamia has recently been delimited by Verdcourt (1963, 1974), Myint & Ward (1968), Austin (1975, 1982a, b), Austin & Ghazanfar (1979), Austin & Cavalcante (1982), Austin & Staples (1985), Gonçalves (1987), and Breteler (1992). In these studies the genus was delimited as having free or partially free styles, non-accrescent sepals, dehiscent fruits, and ovate, obovate, or ovate-cordate cotyledons.

Bonamia douglasii D. F. Austin, sp. nov. TYPE: Nicaragua. Dept. Chontales: Hacienda Veracruz, 12°11′N, 85°22′W, elev. 120–140 m, pastures and gallery forest, 19 Dec. 1984 (fls & buds), *W. Douglas Stevens 23522* (holotype, MO; isotype, FAU). Figure 1.

Species *B. sulphureae* affinis, sed ab ea sepalis exterioribus amplis reniformibus, sepalis interioribus minoribus differt.

Perennial climbers, woody, the stems twining, appressed brown-sericeous when young, glabrescent, older stems brown, lenticellate, striate. Leaves simple, petiolate; lamina coriaceous, elliptic to broadly ovate, 2.5–5.8 cm long, 1.8–5 cm wide, entire, the apex obtuse to mucronate, apiculate, the base obtuse to rounded, brown-sericeous, 4–6 veins conspicuous below, obscure above; petiole canaliculate, 2–5 mm long, 2 mm wide, brown-sericeous. Inflorescences racemose to flowers solitary, near the ends of terminal or on lateral branches, peduncles reduced to ca. 2 mm on solitary flowers, 3–4 mm long in racemes, brown-sericeous; pedicels 5–8 mm long, brown-sericeous; bracts scalelike, 1.5 mm long, triangular, brown-sericeous; sepals unequal, imbricate, the outer longer and broader than the inner, reniform, 8–9 mm long, 9–12 mm wide, coriaceous, basally obtuse, apically rounded, the margins entire, undulate, brown-sericeous, the inner 6–7 mm long, 3–5 mm wide, chartaceous, glabrous; corolla induplicate-valvate and convolute, funnel-shaped, 16–18 mm long, white, brown-sericeous on the midpetaline bands with V-shaped trichomes, the cylindrical tube 6–7 mm long, glabrous; the limb almost entire; stamens equal, included, 4–5 mm long, the filaments fused to the corolla tube, glabrous at the base, the anthers 1–1.5 mm long; nectary 5-lobed; ovary ovoid, 2.5 mm wide and long, brown-sericeous throughout most of the length, the trichomes V-shaped, some areas near the bottom glabrous, the styles 2, unequal, 5–7 mm long, the stigmas capitate, 1 mm wide. Fruits not seen.

The epithet is dedicated to W. Douglas Stevens, indefatigable student of Nicaraguan botany.

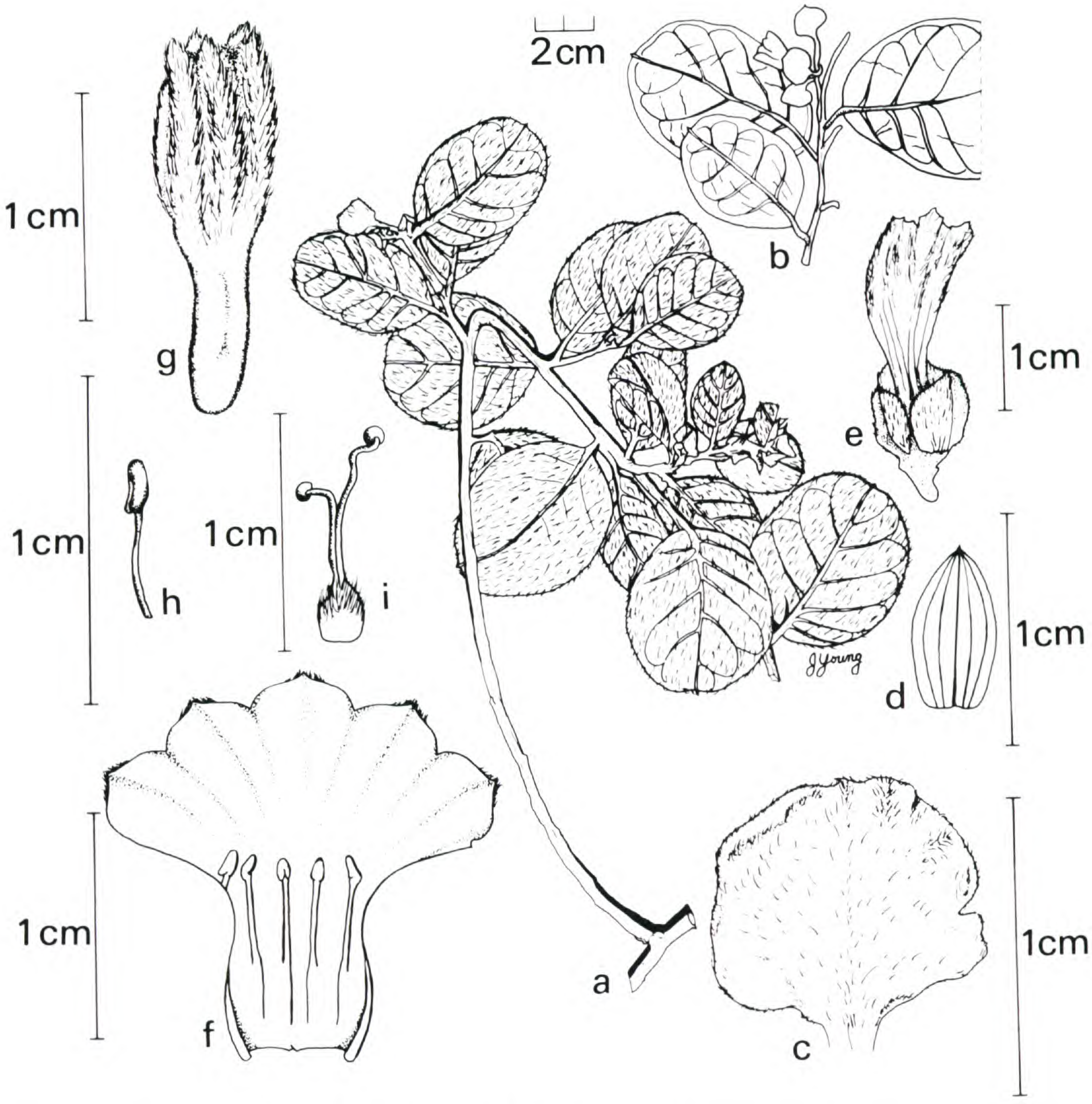

Figure 1. *Bonamia douglasii* D. F. Austin. —a. Habit sketch. —b. Flowering branch with racemose inflorescence. —c. Undulate outer sepal. —d. Inner sepal. —e. Corolla with sepals partly dissected. —f. Dissected corolla with androecium. —g. Intact corolla with pubescent plicae. —h. Stamen. —i. Gynoecium. Based on *Stevens 23522*.

In Central America this species superficially resembles *Bonamia sulphurea* (Brandegee) Myint & Ward, which is now known from Guatemala, Honduras, Mexico (Veracruz) (Myint & Ward, 1968), Panama (Austin, 1975), and Colombia (Santander, *Uribe 3950*, US). If the Stevens specimen had been collected in South America it might have been confused with *B. ferruginea* (Choisy) Hallier f. This latter species shares with the Mesoamerican plants the short pedicels. The two may be distinguished by the capitate inflorescences with 10 or more flowers in *B. ferruginea*, and racemose inflorescences with fewer than 10 flowers in *B. douglasii*.

The fact that the outer sepals are larger than the inner in *B. douglasii* makes it unique among the Central American and North American species of *Bonamia*. The trait, however, does occur in other species of the genus, including: *B. cordata* (Hallier f.) Hallier f., endemic to the Malagasy Republic; *B. ferruginea* (Choisy) Hallier f., from the upper Amazon in South America; *B. kuhlmannii* Hoehne, known from only the type collection in Matto Grosso, Brazil; *B. mossambicensis* (Klotzsch) Hallier f., known from Mozambique and Tanzania; *B. pannosa* R. Brown, endemic to central and western Australia; and *B. peruviana* v. Ooststroom, found only near

Departamento Loreto in Peru. Thus, the large outer sepals in *Bonamia* have arisen in four areas: Central America, South America, Africa—Madagascar, and Australia.

Moreover, having outer sepals larger than the inner or outer sepals enlarging in fruits has arisen several times within the family, including in one form or another *Aniseia* Choisy (Merremieae D. F. Austin), *Bonamia* A. Thouars (Cresseae Bentham & Hooker), the entire tribe Poraneae Hallier f. with nine genera, *Hildebrandtia* Vatke (Hildebrandtieae Peter), and *Jacquemontia* Choisy (Convolvuleae (Choisy) Choisy). Surely there must be some strong force(s) selecting the trait in this suite of species within *Bonamia* and across the family. In some situations the large sepals appear to function as wings for wind-dispersal or maybe water-dispersal. In other cases the larger outer sepals may function to prevent insects biting through the calyx to rob the flower of nectar. No studies of the function(s) have been made.

Acknowledgments. I thank Kay Tomlinson (MO) for assistance with specimens and for arranging for me to study material in St. Louis. Sebsebe Demissew (ETH), a Fulbright Fellow visiting FAU, provided helpful comments on a draft version of the manuscript. Jill Young prepared the drawing.

Literature Cited

Austin, D. F. 1975. Convolvulaceae. *In:* Flora of Panama. Ann. Missouri Bot. Gard. 62: 157–224.

———. 1982a. Convolvulaceae. *In:* Z. L. De Febres & J. A. Steyermark (editors), Flora de Venezuela 8(3): 40–41. Instituto Nacional de Parques, Ediciones Fundación Educación Ambiental, Caracas.

———. 1982b. Convolvulaceae. Pp. 1–99 *in* Flora of Ecuador. Swedish Research Councils, Stockholm.

——— & P. B. Cavalcante. 1982. Convolvuláceas da Amazônia. Museu Paraense Emílio Goeldi, Belém.

——— & S. Ghazanfar. 1979. Convolvulaceae. Pp. 1–64 *in* E. Nasir & S. I. Ali (editors), Flora of West Pakistan. Agricultural Research Council, Islamabad.

——— & G. W. Staples. 1985. *Petrogenia* as a synonym of *Bonamia* (Convolvulaceae), with comments on allied species. Brittonia 37: 310–316.

Breteler, F. J. 1992. Novitates Gabonenses 9. Notes on *Bonamia* (Convolvulaceae) in Central Africa with emphasis on Gabon. Bull. Mus. Natl. Hist. Nat., B, Adansonia 1: 61–71.

Gentry, A. & D. F. Austin. 1988 [1989]. *In:* A. Gentry, New species and a new combination for plants from Trans-Andean South America. Ann. Missouri Bot. Gard. 75: 1429–1439.

Gonçalves, M. L. 1987. Convolvulaceae and Cuscutaceae. *In:* Flora Zambesiaca. Flora Zambesiaca Managing Committee, London.

McDonald, A. 1987. Notas del herbario XAL. X. Tres especies nuevas de Convolvulaceae para México. Biotica 12(3): 217–224.

Myint, T. & D. B. Ward. 1968. A taxonomic revision of the genus *Bonamia* (Convolvulaceae). Phytologia 17: 121–239.

Verdcourt, B. 1963. Convolvulaceae. *In:* Flora of Tropical East Africa. Crown Agents for Oversea Governments and Administrations, London.

———. 1974. The genus *Metaporana* (Convolvulaceae) in Madagascar. Kew Bull. 29: 333–340.

New Species of *Maesa* (Myrsinaceae) from China

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ABSTRACT. *Maesa striatocarpa*, *M. densistriata*, and *M. longilanceolata* are described as new. All three are endemic to Yunnan, China.

During my recent visit to the Smithsonian Institution and the Harvard University Herbaria, an examination of the rich collections of the Myrsinaceae revealed the following novelties.

Maesa striatocarpa C. Chen, sp. nov. TYPE: China. Yunnan: Jianshui, Jiangwai, Guanyin shan, 2,000 m, 5 May 1933, *H. T. Tsai 53314* (holotype, KUN; isotypes, GH, PE, US).

Frutex 1–4(–5) m altus; ramulis glabris, tenuistriatis. Folia elliptico-ovata, 8–14.5 cm longa, 3.3–6 cm lata, membranacea vel chartacea, glabra, undulata, reflexa, acuminata; nervis lateralibus 7–10 jugatis. Folia, sepala, corolla, ovarium, et fructus longitudinaliter glanduloso-striata. Inflorescentia paniculata, 5–12 cm longa, effusa; bracteolis ovatis; pedicellis ca. 1.5 mm longis. Sepala ovata, persistentia, basi connata, ciliata; corolla alba, brevi campanulata, lobis late ovatis vel subreniformis, tubo longioribus vel aequantibus, margine denticulata vel crenulata; staminibus ad medium tubi insertis, inclusis; ovario ovoideo. Fructus globosus, ca. 3 mm diametro, luteolus, sepalis prope ad summum fructus persistentibus.

Shrubs 1–4(–5) m tall. Branchlets slender, straight or sometimes recurved, glabrous, angulate and very slightly striate; older branches with lenticels. Petiole 1–2 cm long; leaf blade elliptic-ovate, 8–14.5 cm long, 3.3–6 cm wide, membranous to papery, glabrous on both surfaces, base cuneate, rounded, obtuse, or sometimes subtruncate, margin reflexed, shallowly or deeply undulate with subglandular teeth, apex long acuminate, somewhat curved; lateral veins 7–10 pairs, ending in teeth. Leaf blades, sepals, corolla lobes, ovaries, and fruits usually densely longitudinally glandular striate. Inflorescences paniculate, terminal or axillary, 5–12 cm long, effuse; bracteoles ovate, entire, longitudinally glandular striate. Pedicel ca. 1.5 mm long. Flowers white, ca. 2 mm long. Sepals ovate, persistent, united at base, ciliate, glabrous. Corolla short campanulate, lobes equaling tube or longer, broadly ovate or subreniform, margin minutely denticulate or crenulate, apex rounded. Stamens included, inserted at middle of corolla tube; anthers broadly ovate or reniform, as long as filaments. Pistil included; style short, persistent; stigma flattened, slightly lobed. Fruits yellowish, globose, ca. 3 mm diam.

Maesa striatocarpa is endemic to southeastern Yunnan, where it grows in dense broad-leaved forests and damp places and on hillsides at 1,300–1,800 m. It was treated by Chen (1977, 1979) as *M. striata* Mez var. *opaca* Pitard, but the latter is a different taxon with a leaf apex only slightly subrounded. The new species differs from the related *M. montana* A. de Candolle (SW to SE China, Indo-China, Thailand, and tropical India) in having elliptic-ovate leaves, glabrous branchlets and pedicels, and a distinctly longitudinally glandular striate calyx.

Paratypes. CHINA. **Yunnan:** Wenshan, alt. 1,900 m, 15 Jan. 1933, *H. T. Tsai 51550* (GH, KUN, PE); Ping-bian, alt. 1,100 m, 20 June 1934, *H. T. Tsai 60352* (GH, KUN, PE).

Maesa densistriata C. Chen & C. M. Hu, sp. nov. TYPE: China. Yunnan: Luxi, Zhefang, near Nongqiu, ca. 1,200 m, 2 Dec. 1958, *C. Chen 461* (holotype, KUN; isotype, PE).

Frutex 1–2 m altus; ramulis angulatis, glabris, juvenis puberulis. Folia oblonga, elliptico-lanceolata, vel oblanceolata, 8.5–14 cm longa, 2.5–5.5 cm lata, chartacea, glabra, basi cuneata, serrata, dense longitudinaliter glanduloso striata, nervis lateralibus ca. 10-jugatis. Infructescentia 1.5–4 cm longa, paniculata, axillaris, glabra; bracteis lanceolatis, ca. 0.5 mm longis; bracteolis ovatis, glabris; pedicellis 1–2 mm longis. Floris ignotis. Fructus globosus, 3–4 mm diametro, paulo carnosus, glaber, eglandulosus; sepalis persistentibus ovato-triangularis, glabris, plus minusve ciliatis, apice glandulosis.

Shrubs 1–2 m tall. Branchlets angular, sparsely puberulent when young, glabrescent when mature. Petiole ca. 1.5 cm long; leaf blade oblong, elliptic-lanceolate to oblanceolate, 8.5–14 cm long, 2.5–5.5 cm wide, papery, glabrous on both surfaces, densely and minutely longitudinally glandular striate, base cuneate, margin serrate, apex acute or abruptly acuminate; midrib and lateral veins prominent especially abaxially, lateral veins ca. 10 pairs, ending in teeth. Infructescences axillary, paniculate, 1.5–4 cm long, many-branched, glabrous, inserted at leaf axils of 2-year-old branches; bracts lanceo-

late, ca. 0.5 mm long, bracteoles ovate, glabrous. Pedicel 1–2 mm long, glabrous. Flowers unknown. Fruits globose, 3–4 mm diam., somewhat fleshy, glabrous, not glandular; persistent sepals ovate-triangular, glabrous, glandular at tip, ± ciliate.

Maesa densistriata is endemic to western Yunnan. It grows in sparse broad-leaved forests and shrubby areas and on sunny hillsides at ca. 1,900 m. It was treated by Chen (1979) as *M. chisia* Buchanan-Hamilton ex D. Don. The new species is distinguished from that taxon by its oblong, elliptic-lanceolate to oblanceolate leaves, lateral veins ending in teeth, and glabrous pedicels.

Paratypes. CHINA. **Yunnan:** Ruili, Mengxiu, alt. 900 m, 10 Dec. 1958, *C. Chen 519* (KUN); Longlin, Yunlong Shan, alt. 1,510 m, 28 Dec. 1958, *C. Chen 638* (KUN); Luxi, Jiangton, 7 Sep. 1958, *S. K. Wen 580310* (KUN); Tengchong, Longtan laoqing, alt. 1,880–1,980 m, 19 Oct. 1960, *W. Q. Yin 60–1366* (KUN).

Maesa longilanceolata C. Chen, sp. nov. TYPE: China. Yunnan: Gongshan, Kiukiang Valley, Taron, Monging, 1,350 m, 10 Sep. 1938, *T. T. Yu 20190* (holotype, KUN; isotypes, GH, PE, US).

Frutex 1.5–2(–5) m altus, ramulis puberulis hirsutis. Folia oblongo-elliptica vel oblongo-lanceolata, 6–14 cm longa, 2.5–4.8 cm lata, chartacea, ad nervam strigosa vel fere glabra, 7 vel 8 jugatis. Inflorescentia axillaris, paniculata, 3–5 cm longa; bracteis lineari-lanceolatis, ca. 1 mm longis, bracteolis oblongo-ovatis vel ovatis, 0.6–0.8 mm longis, ciliatis; pedicellis 1.2–1.5 mm longis. Sepala late ovata, glabra, longitudinaliter glanduloso-striata; corolla alba, campanulata, tubo 1.2–1.5 mm longo, lobis subrotundis, erosis, vix tubum aequantibus, 3 glanduloso-nerviis. Fructus globosus vel ovoideus, 3–4 mm diametro, glaber, longitudinaliter costatus.

Shrubs 1.5–2(–5) m tall. Branchlets puberulent and hirsute, glabrescent, slenderly striate, slightly angular when young, cylindric when mature. Petiole 7–12 mm long, pubescent or hirsute; leaf blade oblong-elliptic or oblong-lanceolate, 6–14 cm long, 2.5–4.8 cm wide, papery, densely strigose along major veins and sparsely so or subglabrous on smaller ones, base broadly obtuse or subrounded, margin irregularly dentate on apical part with glandular-tipped teeth, entire toward base, apex acuminate or caudate-acuminate, rarely acute; midrib and lateral veins flattened adaxially, prominently raised abaxially; lateral veins 7 or 8 pairs, ending in teeth, glandular striate. Inflorescences axillary, paniculate, 3–5 cm long, hirsute, few-branched; bracts linear-lanceolate, puberulent, ca. 1 mm long; bracteoles oblong-ovate or ovate, 0.6–0.8 mm long, acute or acuminate, puberulent, ciliate. Pedicel 1.2–1.5 mm long, puberulent. Flowers white, ca. 2 mm long. Sepals broadly ovate, glabrous, short ciliate, longitudinally glandular striate, acute or subrounded at apex. Corolla campanulate, tube 1.2–1.5 mm long; lobes subrounded, erose, subequaling tube, 3 glandular-veined. Fruits globose or ovoid, 3–4 mm diam., glabrous, somewhat fleshy, longitudinally ribbed; persistent sepals meeting at about the conical style base, exposed part ca. ⅓ length of fruit.

Maesa longilanceolata is endemic to northwestern Yunnan, where it grows in or at margins of broad-leaved forests, on hillsides, in valleys, and along river banks at 1,250–1,800 m. It was treated by Chen (1977, 1979) as *Maesa marionae* Merrill. From the latter, the new species differs in having membranous to submembranous, oblong-elliptic or broadly oblong-lanceolate leaves 6–14 × 2.5–4.8 cm, which are glabrous or densely strigose along the main veins.

Paratypes. CHINA. **Yunnan:** Gongshan, Sep.–Oct. 1940, *M. K. Feng 8124* (A, KUN); Gongshan, Lahan, alt. 1,800 m, 13 May 1960, *NW Yunnan Expl. 8460* (KUN); Bijiang, alt. 1,300 m, 30 Aug. 1964, *S. K. Wu 8545* (KUN).

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Literature Cited

Chen, C. 1977. Myrsinaceae. Fl. Yunnan. 1: 313–384.

———. 1979. Myrsinaceae. Fl. Reipubl. Popularis Sin. 58: 1–147.

Lycianthes starbuckii and *Lycianthes rzedowskii* (Solanaceae), Two New Species of Perennial Herbs from Mexico

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ABSTRACT. Two new species of *Lycianthes* series *Meizonodontae* from Mexico are described and illustrated: *L. starbuckii* E. Dean and *L. rzedowskii* E. Dean.

Lycianthes comprises about 200 species (D'Arcy, 1991) with a distribution that encompasses Mexico, Central America, South America, and some regions of Asia and the Pacific. The genus was last monographed by the German botanist Georg Bitter (Bitter, 1919), and although his work remains the most complete reference for *Lycianthes*, its impenetrability has probably discouraged more students than it has inspired. Thus, the best recent publications on the genus are floristic treatments (see D'Arcy, 1973; Nee, 1986; Gentry & Standley, 1974; Barboza & Hunziker, 1992). Workers who have completed floristic treatments of the genus have commented on the paucity of herbarium collections of some *Lycianthes* species and have suggested that this might be due either to the relative rarity of some of the species (D'Arcy, 1973) or the nocturnal flowers many of them possess (Nee, 1981).

Most *Lycianthes* species are trees, shrubs, or vines; less than ten percent are perennial herbs. Bitter's *Lycianthes* series *Meizonodontae* is one group of perennial herbs, distinguished by their combination of large tuberous storage roots, single-flowered inflorescences, large fruits, and large dark seeds. As part of a taxonomic revision of the series, it has become necessary to describe two new species.

TERMINOLOGY

As with all *Lycianthes* and many species of tribe Solanae, the branching pattern of the species of series *Meizonodontae* combines early monopodial and later sympodial growth. The aboveground stems emerge annually during the summer rainy season and die back during the winter dry season. The first stem-segment to emerge from the root is monopodial, with the leaves spirally arranged, usually terminating in an inflorescence or bud; thereafter, the branching pattern is sympodial, with each stem-unit difoliate, the leaves usually geminate, each unit ending in either a flower or bud (Child & Lester, 1991). Lateral branches growing from leaf axils of the first monopodial stem repeat this pattern of early monopodial and subsequent sympodial growth.

The flowers of all of the species of series *Meizonodontae* are oriented plagiotropically (laterally) due to a slight curvature at the tips of the pedicels. For three to five days in a row, the flowers open each morning, closing after several hours. The rotate corolla, which enlarges each day that it opens, is divided into five fleshy lanceolate segments that are connected nearly to their tips by thin translucent corolla tissue. I will use the terms corolla lobes and corolla membrane to refer to the segments and translucent tissue, respectively. As the corolla enlarges, the stamen filaments elongate, resulting in asynchronous anther dehiscence. Often two dehisce the first day, two the second day, and the fifth on the third day.

Lycianthes starbuckii E. Dean, sp. nov. TYPE: Mexico. México: Sierra de Nanchititla, oak forest across the reservoir from the town of Nanchititla, 1,945 m, 8 Nov. 1991, *E. Dean et al. 315* (holotype, UC; isotypes, BM, ENCB, MEXU, MO, NY, XAL). Figure 1A–G.

Herbae perennes ramosissimae prostratae vel ascendentes. Folia sympodialia crasse chartacea, basi cuneata, apice acuta vel obtusa. Inflorescentiae uniflorae. Flos dentibus calycinis sub anthesi flexuosis, laxis, non reflexis; corolla lilacina rotata; filamentis staminalibus inaequalibus, duobus summis brevissimis, duobus lateralibus longitudine intermediis, infimo longissimo sed lateralibus semper minus quam 2-plo longiore. Fructus ovoidei atropurpurei granulis scleroticis carentes; seminibus nigris.

Perennial *herbs* from tuberous storage roots, to 15 cm tall, usually prostrate. *Indument* of simple, acute, several-celled trichomes, present throughout. *Stems* emerging from buds on the root crown; underground stems whitish, the leaves undeveloped; aboveground stems green-purple, prostrate to ascending, highly branched from near the soil level, terete in cross section; aboveground portion of monopodial stem segment usually very short, 0.5–

Figure 1. *Lycianthes starbuckii* E. Dean (A–G) and *Lycianthes rzedowskii* E. Dean (H–L). *L. starbuckii* (from *E. Dean et al. 315*): —A. Fruiting plant. —B. Enlargement of flowering sympodia illustrating floral bud development typical of series *Meizonodontae*. —C. Calyx at anthesis. —D. Gynoecium. —E. Enlargement of stigma (typical of *L. rzedowskii* as well). —F. Stamens (left to right: lowest, lateral, upper). —G. Mature fruit. *L. rzedowskii* (from *E. Dean & T. Starbuck 212 and 322a*): —H. Fruiting plant. —I. Calyx at anthesis. —J. Flower. —K. Stamens (left to right: lowest, lateral, upper). —L. Gynoecium. (Drawn by the author.)

3(–18.5) cm long; sympodial growth extensive, often forming mats, with both monochasial (one-sided) and dichasial (two-sided) branching points occurring in an unpredictable pattern, with dichasial fork angles 60–180°; sympodial units 2 mm long, 1 mm wide at tips of plant, 1.2–3 cm long when subtending newly opened flowers, the oldest sympodial units 0.7–5.5 cm long, 1.5–4 mm wide. *Stem pubescence* similar throughout, stems pilose to velutinous with trichomes 0.25–0.5 mm long near the soil level, these shorter distally 0.1–0.25 mm long. *Leaves of first monopodial stem* few, 2–5, spirally arranged, the first leaves often scalelike, the subsequent ones expanded, each larger than the one below it; expanded leaves spathulate to obovate or oblanceolate, the margin entire, the tip broadly acute to rounded, cuneate at base and attenuate into petiole, this basal portion plus petiole accounting for ⅓–½ of total leaf length; mid-stem leaves to 3.3 cm long, 1.5 cm wide, the petiole to 0.8 cm long; the largest and distalmost leaf to 6 cm long, 3 cm wide, the petiole to 1.8 cm long. *Sympodial leaves* thick chartaceous, fleshier than those of other species of series *Meizonodontae*, the sympodial units difoliate, usually geminate, sometimes appearing unifoliate if subtending dichasial forks, or trifoliate due to bud expansion; largest leaves (often produced by first sympodial units) ovate to broadly elliptic to rhombic,

the margin entire to undulate, the tip broadly acute to rounded, cuneate at base, becoming reduced, narrowed, elliptic, subsessile distally; geminate leaves similar in shape, unequal in size, the smaller ¼–½ the size of the larger, with more oblique leaf base, shorter petiole, and rounder tip, the largest leaves to 6 cm long, 3 cm wide, the petiole to 1.4 cm long (generally shorter). *Leaf pubescence* similar throughout, the leaves puberulent, the acute appressed trichomes adaxially 0.25–0.5 mm long, pointing uniformly toward the leaf margin, abaxially to 0.25 mm long, appressed-ascending along veins, the margins short-ciliate with ascending trichomes 0.25–0.5 mm long. *Inflorescences* one-flowered, terminating the stem-units, appearing to be opposite the geminate leaf-pairs or the single leaves of dichasial forks. *Buds* ovoid, the corolla at first included in the calyx and covered by the clasping teeth, then exserted, the corolla lobes pubescent abaxially, the calyx teeth lax. *Pedicels at anthesis* green with some purple, pilose with erect trichomes of two distinct lengths, the shorter (to 0.25 mm) regularly interspersed with the longer (0.5 mm); youngest buds (less than 5 mm long) subtended by short, erect pedicels, these elongating, becoming recurved then erect, 4.2–8.6 cm long when corollas open, usually surpassing the subtending leaves, curved only at tips, the flowers oriented plagiotropically. *Calyx at anthesis* green and purple, narrowly to broadly conical, 3–4 mm long, 4–5.5 mm wide, always broader than long, truncate, the margin with hyaline membrane, ten-ribbed, the ribs giving rise to 10 slender teeth that are 2–6.5 mm long, lax and flexuous, not reflexed, the ribs and teeth pilose, the spreading trichomes to 0.5 mm long. *Corolla* sympetalous; tube short, 1.5–2 mm, included in the calyx; limb rotate, 2.1–3.8 cm diam., with five valvate lobes connected nearly to their apices by the corolla membrane; lobes oblanceolate, lilac with 3–5 darker violet veins on adaxial sides, lilac and green on abaxial sides, curving backwards upon opening, slightly unequal in width, the upper 2.5–3.75 mm broad, the lower 3.25–5 mm broad, the tips curved inward in bud and remaining so as the corolla expands; membrane lilac, notched at the margin, with folds puckered outward on the adaxial side; pubescence of corollas concentrated on the abaxial side of the lobes, these puberulent with trichomes to 0.25 mm long, the lobe tips tufted with trichomes 0.1–0.3 mm long, the membrane sometimes short-ciliate near the lobes. *Androecium* of five stamens, the filaments of three different lengths, elongating each day the flower opens, the lowest stamen the longest, the two lateral of intermediate length, and the two upper the shortest; filaments pale green, glabrous, compressed laterally, the filament of the lowest stamen 2.0–5.25 mm long, elongating more than the others (the lateral 1.5–3.75 mm long, the upper 1.25–3.25 mm), always less than twice the length of the lateral filaments; anthers dark yellow, exuding a sweet fragrance, lanceolate to elliptic, the lowest anther 3.25–4.75 mm long, the lateral anthers 3.25–5.0 mm long, the upper anthers 3.25–5.25 mm long, the pores of all anthers round and terminal. *Gynoecium* of two united carpels, the ovules 25–38; ovary conic to ovoid, 1.5–2.5 mm long; style straight to slightly curved, 7–10 mm long, the stigma capitate, shallowly lobed, slightly oblique, 0.5 mm diam. *Fruit* a berry without sclerotic granules, green when immature, at maturity glossy or dull dark purple-black, separating from calyx, 7–22 mm long, 7–17 mm wide, ovoid, the tip rounded to apiculate; fruiting calyx thicker and wider than at anthesis, 2–5.5 mm long, 6–12.5 mm wide, the teeth reflexed or spreading, sometimes breaking, drying as the fruit matures, 0.5–6.5 mm long; fruiting pedicel 5.2–12.2 cm long, deflexed, undulate (the attached fruit often lying on the ground), swollen at juncture to the calyx, the swelling 1.5–4.5 mm wide; seeds 2–29, rusty brown to black, reniform to suborbicular, 3.5–4.5 mm long, 3–3.5 mm wide, always longer than broad.

Distribution. Endemic to the Sierra de Nanchititla, in the southwestern part of the state of México, Mexico, on level oak forest floor, 1,945 m.

Lycianthes starbuckii flowers in July and August and produces fruits from October to November. It can be distinguished from other species of series *Meizonodontae* by its combination of prostrate to ascending (often mat-forming) habit, velutinous stems, thick blunt-tipped sympodial leaves with short cuneate bases, lax calyx teeth at anthesis, hairy corolla lobes, and dark purple fruits with large brown to black seeds. The only other prostrate species within the series are *L. peduncularis* (Schlechtendal) Bitter, a species restricted to dry eroded volcanic or limestone habitats, and *L. moziniana* (Dunal) Bitter, which grows along roadsides or in agricultural fields. Both have fruits that are green at maturity, and those of *L. peduncularis* have well-developed sclerotic granules. The habitat of *L. starbuckii* is distinct from those of closely related species. Although other species of series *Meizonodontae* grow in oak forest, they are generally found on moderate to steep slopes near drainages, while *L. starbuckii* is found on level forest floor.

This species is named for my husband and ace field assistant, Thomas Junn Starbuck, who has helped me in countless ways with my dissertation research. While walking near Nanchititla, he observed the

first plant of *L. starbuckii* after the rest of the group had stepped on it.

Paratype. MEXICO. **México:** District of Temascaltepec, Nanchititla, 18 Aug. 1933, *Hinton et al. 4550* (BM, G, K, MEXU, MO).

Lycianthes rzedowskii E. Dean, sp. nov. TYPE: Mexico. Michoacán: Mpio. Charo, along hwy. 15, 20 rd. km E of Morelia, just E of Pontezuelas, 2,165 m, 13 Nov. 1991, *E. Dean & T. Starbuck 322a* (holotype, UC; isotypes, NY, XAL). Figure 1H–L.

Herbae perennes erectae vel reclinatae; caulibus monopodialibus (6–)10–21-foliatis. Folia membranacea vel chartacea, basi attenuata, apice acuminata. Inflorescentiae uniflorae. Flos dentibus calycinis sub anthesi erectis vel reflexis; corolla rotata alba venulis violaceis ornata; filamentis staminalibus inaequalibus, duobus summis brevissimis, duobus lateralibus longitudine intermediis, infimo longissimo sed lateralibus nunquam plus quam 2-plo longiore. Fructus elongati fusiformes vel conici, ad apicem attenuati, purpurati ad nigri, granulis scleroticis carentes; seminibus nigris.

Perennial *herbs* from tuberous storage roots, 1.7–11.0 dm tall, erect to reclinate (falling sideways with age). *Indument* of simple or branched, acute, several-celled trichomes present throughout. *First monopodial stems* one to several, first erect, then reclinate, emerging from buds on the root crown; underground parts of stems glabrous, white or purplish, the leaves undeveloped, often with stem-borne roots just below the soil level; aboveground parts of monopodial stems green to reddish purple, terete when fresh, collapsed, ribbed, when dry, 7–90 cm long, 2–8 mm at broadest point (at base or middle of stem); internodes 0.5–25 cm long, the shortest internodes near the base, the longest near the middle or upper part of the stem. *Sympodial growth* poorly developed compared with other species of series *Meizonodontae*, progressing laterally a total of 6–40 cm, shorter than initial monopodial stems; first two sympodial branching points usually dichasial (rarely only first branching point), appearing as forks, the fork angles often narrow, 60–90(–100)°, subsequent sympodial growth monochasial; sympodial units 0.5–5 mm long, 0.25–1.5 mm wide at tips of plant, (0.3–)0.8–2.7(–5.0) cm long, 1–2 mm wide when subtending newly opened flowers, the oldest sympodial units 1–11 cm long, 2–5 mm wide. *Stem pubescence* similar on monopodia and sympodia, young stems pilose to villous (sometimes glabrous), glabrate, trichomes 0.5–1.0 mm long, rarely of two distinct lengths, the shorter less than 0.25 mm long, regularly interspersed with others 0.5–1.0 mm long. *Leaves of first monopodial stem* usually numerous, (6–)10–21, spirally arranged, the first leaves scale-like and often soon deciduous, subsequent leaves expanded, membranaceous to chartaceous, divided into an expanded lamina and attenuate base, the attenuate portion plus petiole accounting for ⅛–⅓(–½) of total leaf length; lamina narrowly to broadly ovate to elliptic or obovate, the margin undulate, the tip acute to acuminate, the base obtuse to cuneate and attenuate into petiole; leaf size increasing with stem height, the largest leaves at middle to upper one-third of stem, then decreasing slightly to stem apex (rarely the largest at apex); total monopodial leaf length 1.5–15 cm, width 0.5–6 cm, the petiole poorly defined, 1–28 mm long. *Sympodial leaves* membranaceous to chartaceous, the sympodial units difoliate, usually geminate, sometimes appearing unifoliate if subtending dichasial forks, or trifoliate due to bud expansion; largest leaves (often produced by the first sympodial units) similar in shape to those of the monopodial stem, the lamina ovate to elliptic, the margin undulate, the tip acute to acuminate, cuneate at base and short-attenuate into the petiole, becoming reduced, narrower (lanceolate), and subsessile distally; geminate leaves similar in shape, unequal in size, the smaller ¼–¾ the size of the larger, with a more oblique leaf base; largest leaves 2.5–10.0 cm long, 1.5–4.6 cm wide, the petiole poorly defined, 0.5–10.0 mm long. *Leaf pubescence* similar throughout, the leaves puberulent, the adaxial trichomes appressed, uniformly pointing at the same angle toward leaf margin, abaxially with trichomes spreading, concentrated on leaf veins, the margins ciliate, the trichomes in all parts of similar length, 0.25–1.0 mm. *Inflorescences* one-flowered, terminating the stem-units, appearing to be opposite the geminate leaf-pairs or the single leaves of dichasial forks. *Pedicels at anthesis* green, sometimes with a few purple spots, glabrous to nearly villous, the trichomes spreading to slightly retrorse, straight to slightly undulate, even, 0.5–1.5 mm long; youngest buds (less than 5 mm long) subtended by short, erect pedicels, these elongating, becoming recurved, then erect, 1.9–8.6 cm long when corollas open, usually shorter than the subtending leaves, curved only at tips, the flowers oriented plagiotropically. *Calyx at anthesis* green, campanulate, 3.0–6.0 mm long, 3.25–6.0 mm wide, truncate, the margin with a hyaline membrane, ten-ribbed, the ribs giving rise to 10 stout teeth at two distinct levels ca. 0.5–1 mm below margin, the teeth variable in shape and length, from small knobs to linear-lanceolate and 7.25 mm long, erect to slightly reflexed, the ribs and teeth glabrous to villous, the trichomes spreading to somewhat retrorse. *Corolla* sympetalous, slightly nodding; tube short, 1.5–2.5 mm long,

included in the calyx; limb rotate, 2.0–4.7 cm diam., with five valvate lobes connected nearly to their apices by the corolla membrane; lobes lanceolate to oblanceolate, white with 3–5 violet veins near throat on the adaxial sides, abaxial sides green, curving backwards upon opening, the upper narrower, 2.5–4.5 mm wide, the lower 3–6 mm wide, the tips curved inward in bud and remaining so as the corolla expands; membrane white, translucent, notched at the margin, pulled smooth and taut when lobes open; corolla glabrous except for tips of lobes, these tufted with short trichomes, 0.1 mm long, the membrane near the lobes sometimes short-ciliate. *Androecium* of five stamens, the filaments of three different lengths, the lowest stamen the longest, the two lateral of intermediate length, and the two upper the shortest; filaments pale green, compressed laterally, sometimes slightly pubescent, elongating each day the corolla opens, the filament of the lowest stamen 2.5–6.25 mm long, elongating more than the others (the lateral 2.0–4.0 mm long, the upper 1.0–4.0 mm long), always less than twice the lateral filaments; anthers light yellow, exuding a sweet fragrance, broadly lanceolate to elliptic, the lowest anther 3.25–5.5 mm long, the lateral 3.25–5.25 mm long, upper 3.5–5.5 mm long, the pores of all anthers round to oval, terminal. *Gynoecium* of two united carpels, the ovules 30–70; ovary conic, 2.5–4.0 mm long, often attenuate into a straight to gently curved style, 7–11 mm long, the stigma captitate, rarely somewhat lobed, slightly oblique, 0.5 mm diam. *Fruit* a berry without sclerotic granules, light green with lighter or darker green spots or lines when immature, at maturity dull light purple to black, not falling easily from the calyx, turbinate, elongate, 19–75 mm long, 8–19 mm wide, the tip attenuate; fruiting calyx thicker and wider than at anthesis, 2.0–10.0 mm long, 5.0–14.5 mm wide, the teeth stout, stiff, often breaking, drying as fruit matures, remaining appressed to fruit or somewhat spreading, 1–7.5 mm long; fruiting pedicel deflexed, pendent, 3.0–10.0 cm long, swollen at the attachment to the calyx, this swelling 2.5–7.5 mm wide; seeds 3–38, rusty brown to black, reniform to suborbicular, 3.5–5 mm long, 3–4 mm wide.

Distribution. On forested slopes near drainages in the transvolcanic belt of Mexico, states of México, Morelos, and Michoacán, 1,794–2,645 m.

Lycianthes rzedowskii flowers from late July to September and produces fruit from November to January. Specimens of this species have been referred to several other species of *Lycianthes* such as *L. moziniana* (Dunal) Bitter, *L. somniculenta* (Kunze ex Schlechtendal) Bitter, and *L. pilifera* (Bentham) Bitter. *Lycianthes rzedowskii* can be distinguished from other species of series *Meizonodontae* by its well-developed erect to reclinate monopodial stems with numerous monopodial stem leaves (many of these expanded, rather than scalelike). At the time of flowering, this species has very limited sympodial growth (usually much shorter overall than the main monopodial stem), although in some populations the sympodia elongate during fruit maturation. This species is also distinguished by its combination of smooth white corolla, broad sweetly scented anthers, terminal round anther pores, elongate purple to black fruit, and large brown to black seeds. This species resembles *L. ciliolata* (Martens & Galeotti) Bitter, a species of limestone soils in the Sierra Madre Oriental that has lilac flowers, and *L. acapulcensis* (Baillon) D'Arcy, a species with white flowers and a lemony fragrance whose distribution overlaps with that of *L. rzedowskii*. The best way to distinguish *L. rzedowskii* from the other two species is to look at the relative lengths of the stamen filaments. In *L. rzedowskii* the length of the lowest (and longest) filament is never more than twice that of the lateral filaments, while in the other two species, the length of the longest filament is almost always more than twice that of the lateral filaments.

This species is named for Jerzy Rzedowski, who, along with his many students and collaborators, collected many of the Mexican specimens of series *Meizonodontae* that I have studied. I am grateful for his early encouragement of my work and for his help when I visited Mexico.

Paratypes. MEXICO. **Morelos:** Sierra de Morelos, Cuernavaca, 2,050 m, 26 July 1969, *Hinton et al. 17221* (NY); hacia el Valle del Tepeite, Canal Zempoala, Aug. 1932, *E. Lyonnet 1002* (CAS, MEXU). **México:** La Ciénega, 5 km al S de Sultepec, sobre el camino a Amatepec, 2,400 m, 15 jul. 1973, *J. Rzedowski 30884* (CAS, ENCB, F); Mpio. Sultepec, NE of Capula along the road to Sultepec, ca. 2.5 rd. km from the outskirts of Capula, 1.0 rd. km NW of the turnoff to Tejupilco, 2,317 m, 13 July 1990, *E. Dean & T. Starbuck 212* (BM, ENCB, MEXU, MO, NY, UC, XAL); Mex. hwy. 130, 10.1 mi. N of Temascaltepec, 1,940 m, 27 July 1972, *M. Denton 1900* (UC); District Temascaltepec, Comunidad, 2,610 m, 7 July 1932, *Hinton et al. 971* (BM, F, G, MEXU); District Temascaltepec, Nanchititla, 26 July 1935, *Hinton et al. 8102* (F, GH, MO, NY); Nanchititla, 29 Aug. 1935, *Hinton et al. 8234* (GH, K); Nanchititla, Barranca de la Cueva de Santos, downstream from dam, 1,794 m, 9 Nov. 1991, *E. Dean et al. 317* (UC, XAL). **Michoacán:** Mpio. Zitácuaro, near Macho de Agua, E of Zitácuaro, along old hwy. 15, ca. 6–8 rd. mi. E of RR crossing, 2,584–2,645 m, 11 Nov. 1991, *E. Dean & T. Starbuck 320* (UC, XAL); Zitácuaro, Cerro Pelón, 17 June 1938, *Hinton et al. 11967* (GH, K); along route 15 between K268 and 269, ca. 45 km E of Morelia, 2,830 m, 10 Aug. 1966, *R. Cruden 1171* (MEXU, UC); Las Peras, 38 km E of Morelia (ca. 33

km air dist.), km 272 on hwy. 15 (Ciudad Hidalgo to Morelia), 2,515 m, 13 Sep. 1962, *R. Ugent & C. Flores 2012* (WIS); Mpio. Queréndaro, along old hwy. 15 ca. 0.4 rd. km W of San José de la Cumbre, near the km 195 marker, 2,500 m, 25 July 1990, *E. Dean & T. Starbuck 221* (MEXU, UC); 23 km E of Morelia, km 290 from Mexico City (on old Highway 15), 2,600 m, 28 June 1964, *G. Mick & K. Roe 163, 163a* (WIS); Mpio. Charo, waterfall along old hwy. 15, E of Morelia, just E of intersection with rd. to Tzitzio, 2,250 m, 13 Nov. 1991, *E. Dean & T. Starbuck 322b* (UC, XAL), 7 Dec. 1991, *E. Dean & T. Starbuck 336* (MO, UC, XAL); Mpio. Charo, along hwy. 15, 20 rd. km E of Morelia, just E of Pontezuelas, 2,165 m, 24 July 1990, *E. Dean & T. Starbuck 220* (MEXU, MO, UC); Pontezuelas, 20 km al E de Morelia, sobre la carretera a Zitácuaro (km 289), 2,100 m, 21 jul. 1964, *J. Rzedowski 18374* (ENCB, WIS); 13 mi. E of Morelia, 13 Aug. 1947, *F. Barkley et al. 2786* (F, TEX).

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Literature Cited

Barboza, G. E. & A. T. Hunziker. 1992. Estudios sobre Solanaceae XXXIII, el género *Lycianthes* en la Argentina. Darwiniana 31: 17–34.

Bitter, G. 1919. Die Gattung *Lycianthes*. Abh. Naturw. Ver. Bremen 24: 292–520.

Child, A. & R. N. Lester. 1991. Life form and branching within the Solanaceae. Pp. 151–159 *in* J. G. Hawkes et al. (editors), Solanaceae III, Taxonomy, Chemistry, and Evolution. The Royal Botanic Gardens, Kew.

D'Arcy, W. G. 1973. *Lycianthes. In:* Flora of Panama. Ann. Missouri Bot. Gard. 60: 631–647.

———. 1991. The Solanaceae since 1976, with a review of its biogeography. Pp. 75–137 *in* J. G. Hawkes et al. (editors), Solanaceae III, Taxonomy, Chemistry, and Evolution. The Royal Botanic Gardens, Kew.

Gentry, J. L., Jr. & P. C. Standley. 1974. *Lycianthes. In:* Flora of Guatemala. Fieldiana, Bot. 24(10): 47–65.

Nee, M. 1981. Tips for collecting *Lycianthes*. Solanaceae Newslett. 2: 58–59.

———. 1986. *Lycianthes*. Pp. 85–110 *in* A. Gomez-Pómpa et al. (editors), Flora of Veracruz, Fascículo 49, Solanaceae I. Instituto Nacional de Investigaciones Sobre Recursos Bióticos, Xalapa.

A New Section and Two New Species of *Tragia* (Euphorbiaceae) from the Venezuelan Guayana and French Guiana

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ABSTRACT. A new section and two new species of *Tragia* are described and illustrated. *Tragia guayanensis* from Amazonas, Venezuela, is unique in the genus in having filaments entirely fused into an elongate staminal column and 5-colpate pollen. The new section *Monadelphae* is described to accommodate this unusual species. *Tragia tabulaemontana* from French Guiana belongs to section *Tragia* and is characterized by oblanceolate or narrowly elliptic leaf blades that are narrowly cordate at the base, stamens that are highly dilated at their base, and long-stipitate glandular trichomes on petioles, inflorescence axes, and ovaries. A key to the five sections of *Tragia* in the New World and a key to the five species of *Tragia* in the Guayana Region are given.

Tragia L. is the largest genus of tribe Plukenetieae (Euphorbiaceae: subfamily Acalyphoideae) with approximately 130 species. This genus of twining, scandent, and erect herbs and subshrubs is widely distributed in tropical to warm temperate areas in the New World, Africa, southern Asia, and Australia, but is most abundant in drier areas of Africa and the New World. *Tragia* belongs to subtribe Tragiinae, which is distinguished from subtribe Plukenetiinae by its urticating trichomes, trilocular ovary, and absence of foliar glands.

Two new species of *Tragia* were encountered while preparing treatments of tribe Plukenetieae for the Guianas (Gillespie & Armbruster, in prep.) and for the *Flora of the Venezuelan Guayana* (Gillespie, in prep.). A total of five species of *Tragia* are now known from the Guayana Region (an area encompassing the Guianas, the Venezuelan Guayana, and adjacent areas of Amazonian Brazil north of the Amazon River; Mori, 1991; Gillespie, 1993). One of these new species, *T. guayanensis*, is so distinct that it does not fit into any of the currently recognized sections. A new section is described to accommodate this unusual species and is designated *Monadelphae*, alluding to its unique androecium within *Tragia*.

Nine sections of *Tragia* are currently recognized (Gillespie, 1994; see also Pax & Hoffmann, 1919). These sections are for the most part morphologically very distinct from one another and each is characterized by a unique pollen type (with the exception of sections *Tagira* and *Lassia*, which share a pollen type) (Gillespie, 1994). Among the five New World sections, section *Tragia* is the largest and most widespread with 40–50 species distributed from the southern United States to Argentina. The remaining sections are much smaller and geographically more restricted; in addition to *Monadelphae*, these include *Bia* (Klotzsch) Mueller Argoviensis (ca. 6 species from Panama to Argentina), *Leptobotrys* (Klotzsch) Mueller Argoviensis (2 species in the southeastern United States), and *Zuckertia* (Baillon) Mueller Argoviensis (1 species in Mesoamerica). Among the four Old World sections *Tagira* Mueller Argoviensis is the largest with 40–50 species widespread in Africa and southern Asia. The remaining sections include *Ctenomeria* Harvey (2 species in southern Africa), *Agirta* Baillon (4 species in Madagascar), and *Lassia* Baillon (monotypic in Madagascar) [also in Madagascar is the single described monotypic subgenus *Mauroya*, which is probably best recognized at the sectional level].

Tragia as presently circumscribed is distinguished from other members of subtribe Tragiinae by a combination of plesiomorphic character states, such as slender, only partly connate styles and a flat, glabrous staminate receptacle. The other Tragiinae genera are mostly defined by one or more character states that appear to be derived with respect to *Tragia*. These states include massive free styles (distinguishing *Cnesmone*), styles entirely connate into a massive column (*Megistostigma* and *Sphaerostylis*), convex hairy receptacle (*Platygyna*), and anther connective with apical tuft of stinging hairs (*Acidoton*).

NOVON 4: 330–338. 1994.

The circumscription and number of both sections of *Tragia* and genera of Tragiinae is open to question and needs further study. A major reorganization within subtribe Tragiinae may be necessary to better reflect phylogenetic relationships (Gillespie, 1994). This may include recognition of several sections of *Tragia*, such as *Bia*, *Ctenomeria*, and *Monadelphae*, at the generic level.

KEY TO THE NEOTROPICAL SECTIONS OF *TRAGIA*

1. Filaments completely connate into a central elongate column bearing a cluster of sessile anthers; pollen 5-colpate, staminate sepals 5; inflorescences unisexual, racemose ..... section *Monadelphae*
1. Filaments free or rarely partly connate; pollen tricolpate, weakly triporate, or inaperturate; staminate sepals 3–5(–6); inflorescences bisexual, racemose or branched 2
2. Inflorescence consisting of a racemose staminate main axis and a single elongate basal branch bearing 5–20 pistillate flowers; stamens 8–40+; staminate disc segmented or sometimes absent 3
2. Inflorescence racemose, with 1(–2) pistillate flower(s) at the basal 1(–9) node(s); stamens (1–)2–5(–22); staminate disc mostly absent, if present comprising a single central structure 4
3. Staminate flowers having 3(–4) sepals, 5–10 disc segments, and 6–20 stamens; leaf blades 6–16 cm long, unlobed; pollen inaperturate ..... section *Bia*
3. Staminate flowers having 5 sepals, no disc, and ca. 40 stamens; leaf blades 12–25 cm long, unlobed to shallowly 3-lobed; pollen tricolpate ..... section *Zuckertia*
4. Pollen tricolpate, exine baculate, aperture membrane bearing few scattered islands of sexine or sometimes islands absent; stamens (1–)3–5(–22), staminate sepals 3(–5) ..... section *Tragia*
4. Pollen weakly triporate, exine tectate-punctate, aperture membrane densely covered with numerous small islands of sexine; stamens 2, staminate sepals 4–5(–6) ..... section *Leptobotrys*

Tragia section **Monadelphae** L. J. Gillespie, sect. nov. TYPE: *Tragia guayanensis* L. J. Gillespie.

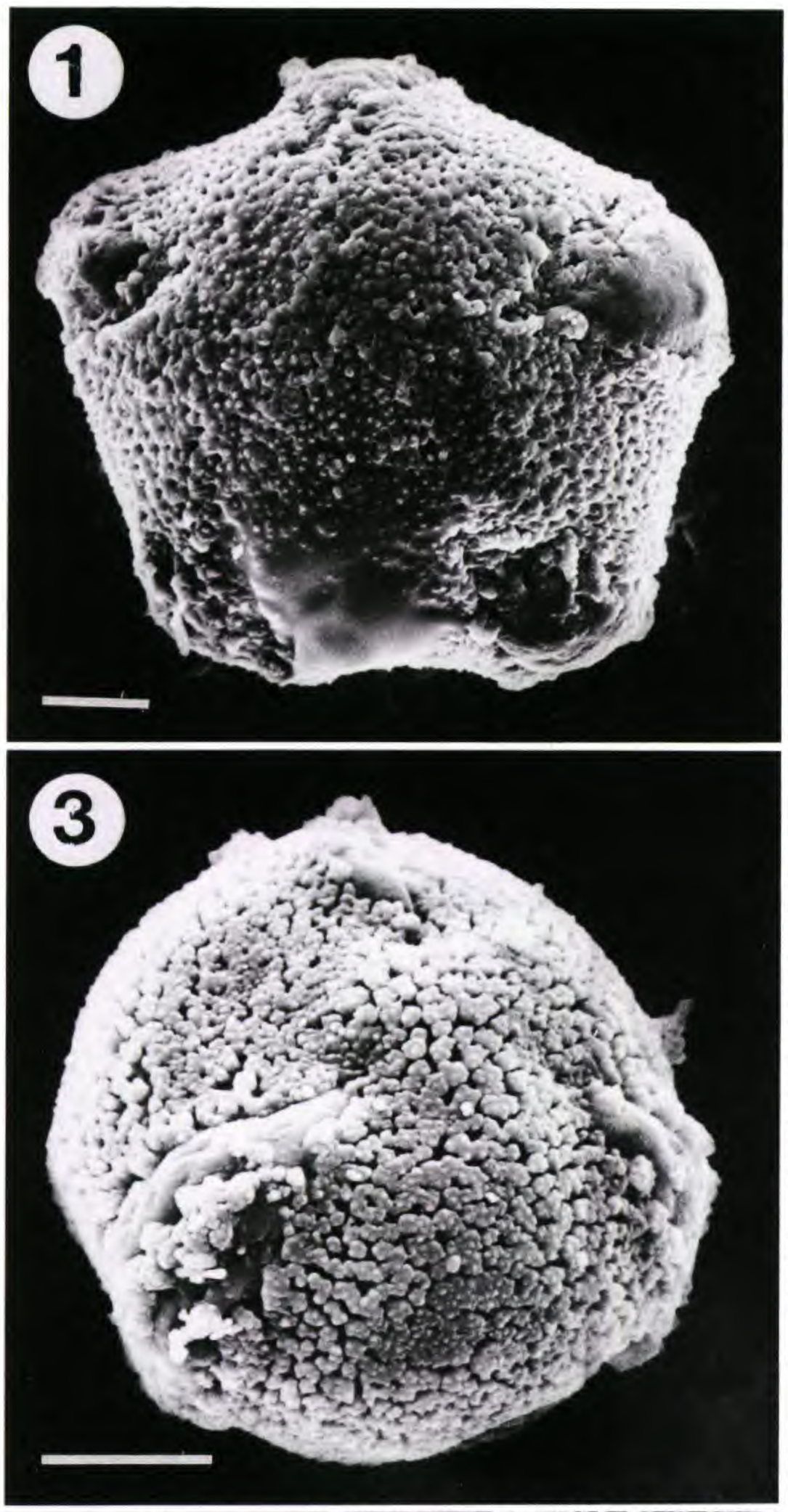
Suffrutices scandentes. Inflorescentia unisexualis racemosa. Sepala masculina 5; discus nullus; stamina monadelpha, columna staminalis elongata, antheris ad apicem aggregatis; pollen 5-colpatum in tectis foveolatum. Sepala feminea 6 integra; styli elongati basi connati.

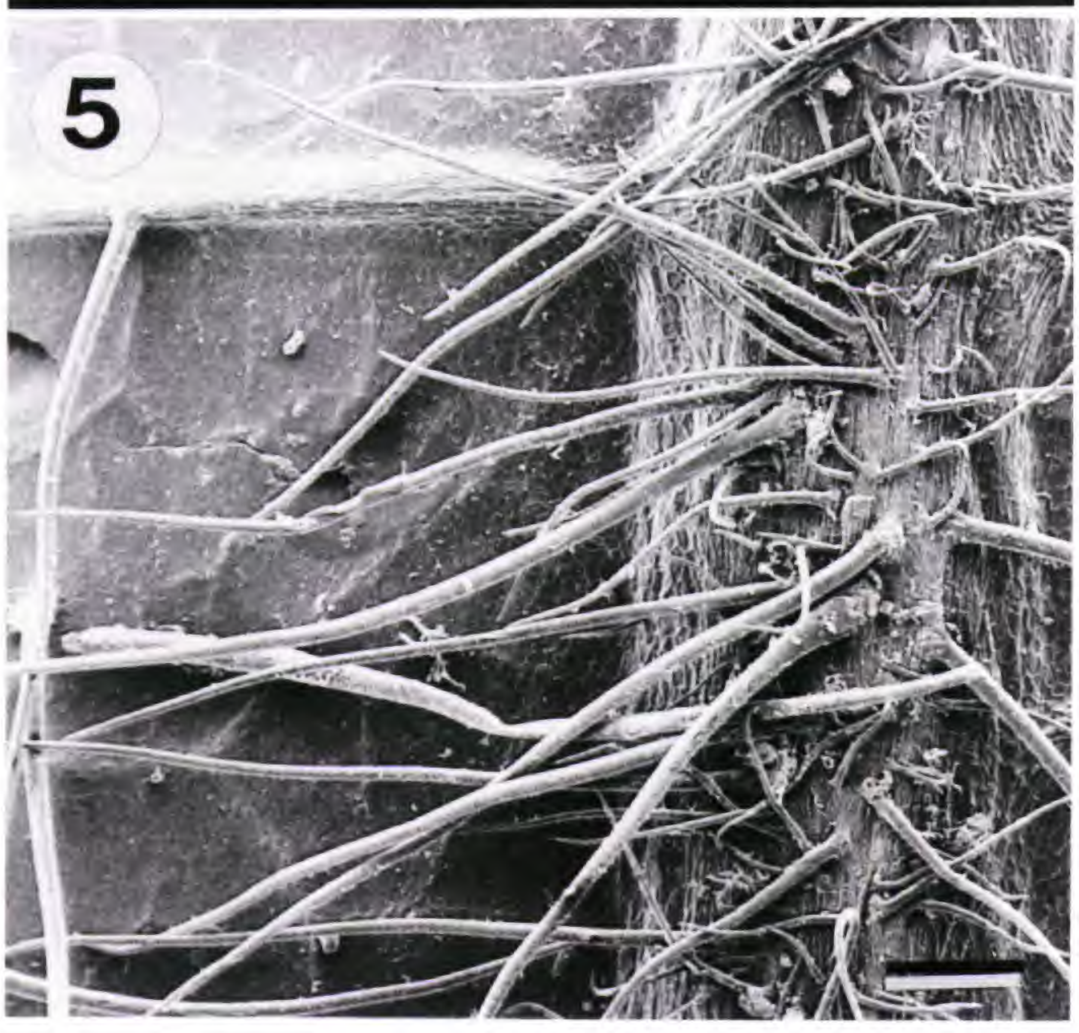
Scandent subshrubs. Inflorescences unisexual, racemose. Staminate sepals 5; disc absent; stamens monadelphous, staminal column elongate with anthers clustered together at apex; pollen 5-colpate, tectum foveolate. Pistillate sepals 6, entire; styles elongate, connate at base. Monotypic, *T. guayanensis*.

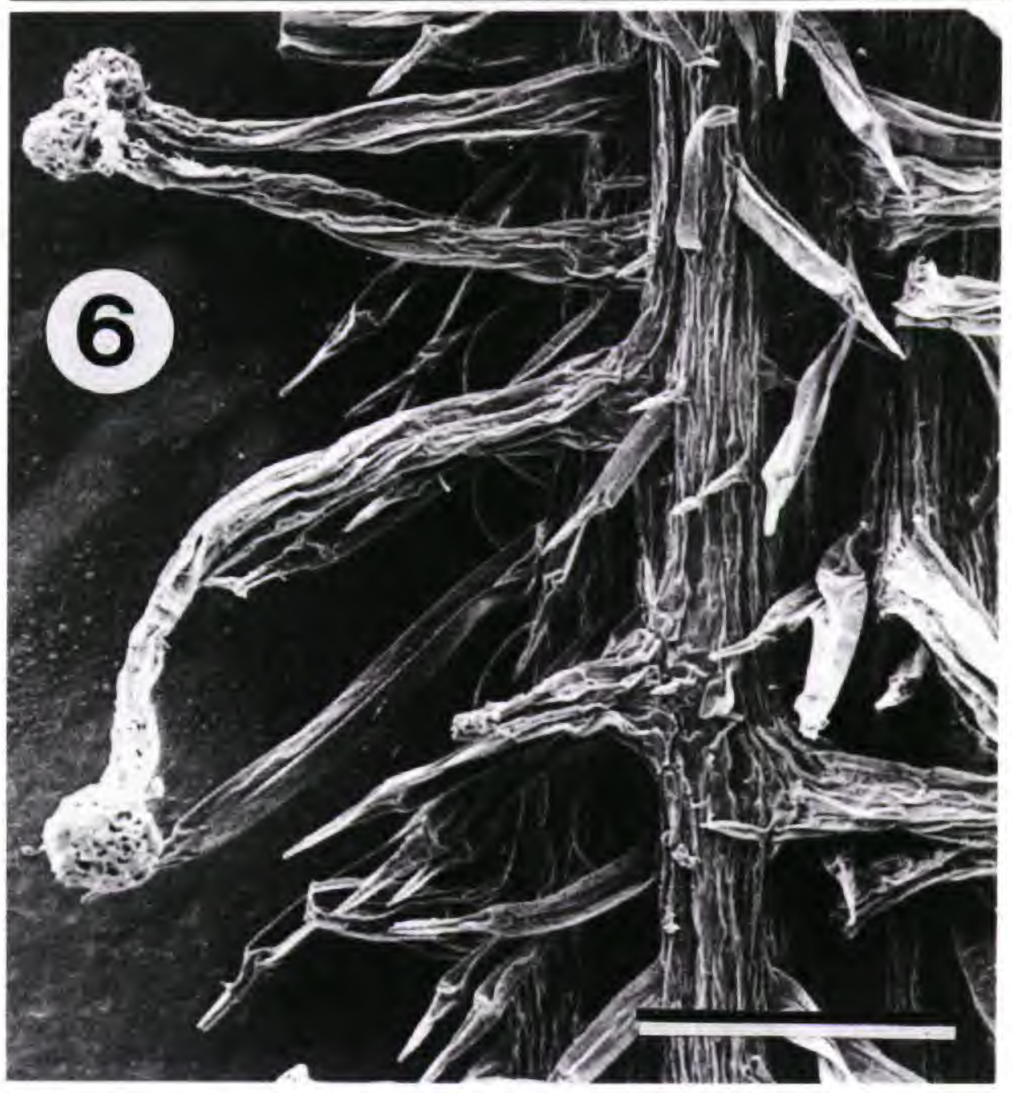
Tragia guayanensis L. J. Gillespie, sp. nov. TYPE: Venezuela. Territorio Federal Amazonas: Río Casiquiare entre la boca del Siapo y el caño Momoni, 18 Feb.–4 Mar. 1986, *Stergios & Aymard 9182* (holotype, MO staminate; isotype, NY pistillate). Figures 1, 2, 5, 7, 9.

Suffrutex scandens. Caules juvenes et petioli longihirsuti trichomatibus urentibus brevissioribus sparsim obsiti. Folia elliptica vel obovata sparsim hirsuta basi anguste cordata. Inflorescentiae unisexuales racemosae; inflorescentia masculina axillaris; inflorescentia feminea terminalis sed a foliis opposita videtur. Sepala masculina 5; discus nullus; stamina monadelpha; columna staminalis elongata antheris circa 5 ad apicem aggregatis; pollen 5-colpatum in tectis foveolatum. Sepala feminea 6 integra; styli elongati cylindrici recti basi connati. Capsula trilobata trichomatibus urentibus obsita.

Climbing subshrub, monoecious?; young stems slender, hirsute with trichomes 1–2 mm long and scattered, much shorter urticating trichomes. Leaves alternate, simple; stipules narrowly triangular or lanceolate, ca. 5 × 2 mm, caducous; petioles 2–5.5 cm long, hirsute and often puberulous; blades charataceous, elliptic or ovate-elliptic, 12–17 × 6–12 cm, apex acuminate with acumen ca. 1 cm long, base narrowly cordate with sinus 0.8–1.6 cm deep, margin irregularly serrulate with tooth apex minutely glandular, sparsely hirsute on both surfaces, midrib puberulous and often more densely hirsute on upper surface; venation pinnate, 3-nerved or obscurely 5-nerved at base, secondary veins mostly subopposite in 5–7 pairs with basal pair opposite at blade base, tertiary veins weakly percurrent, quaternary veins reticulate; petiolar and laminar glands absent. Inflorescence slender, racemose, unisexual, flowers borne singly in bract axil; axes puberulous; bracts lanceolate or narrowly lanceolate; staminate inflorescence ca. 3–5.5 cm long, axillary, bracts 1–2.5 mm long; pistillate inflorescence (known only in fruiting stage) ca. 24 cm long, terminal but appearing leaf-opposed, bracts ca. 3 mm long. Staminate pedicel 3–3.5 mm long, sparsely puberulous; bud narrowly oblong, 2–4 mm long, broadly acute or obtuse at apex; sepals 5, very narrowly oblong, 3–4 mm long, ca. 1 mm wide, acuminate at apex, valvate, sparsely puberulous, reflexed with margins revolute at anthesis; corolla and disc absent; stamens apparently 5, monadelphous; filaments connate into an elongate staminal column, 2.5–3.1 mm long, ca. 0.4 mm diam., bearing a dense cluster of ca. 5 anthers, 1.1–1.5 mm diam., ca. 0.7–0.9 mm high; pollen oblate-spheroidal to suboblate, 45–52 μm in equatorial diameter, 40–49 μm in polar diameter, 5-colpate, colpus with uneven margins, exine tectate-perforate, ca. 2 μm thick, tectum foveolate and microverrucate. Pistillate pedicel ca. 1 mm long,







Figures 1–6. Pollen and trichome morphology of *Tragia*. 1, 2. SEM of pollen of *T. guayanensis* (*Stergios & Aymard 9182*, MO). —1. Polar view showing the five colpi. —2. Close-up of mesocolpium and two colpi. 3, 4. SEM of pollen of *T. tabulaemontana* (*Granville 3576*, U). —3. Polar view. —4. Close-up of colpus with sexine fragment or island on apertural membrane. —5. SEM of leaf blade adaxial surface of *T. guayanensis* (*Williams 14990*, US) showing hirsute and puberulous midrib. —6. SEM of inflorescence axis of *T. tabulaemontana* (*Granville*

densely puberulous (pistillate flower description based on old flowers on infructescence axis); sepals 6, ovate, 2.8–3.8 mm long, attenuate at apex, distinctly imbricate, entire-margined, sparsely pubescent at apex and along margin; corolla and disc absent; ovary 3-lobed, ca. 0.8–0.9 × 1.3–1.4 mm, 3-locular with 1 ovule per locule, densely covered with urticating trichomes; styles 3, mostly free, 6–10 mm long, 0.5–0.8 mm diam., cylindrical, straight, connate for 1–2.5 mm of length, papillose at apex. Fruiting pedicel 3–6 mm long; sepals persistent, mostly reflexed; capsule 3-lobed (irregularly so if fewer than 3 seeds), ca. 5–5.5 mm long, dehiscing into 3 bivalved mericarps, each mericarp ca. 5–5.5 mm long and thick, 6.4–6.8 mm wide; pericarp woody, ca. 0.4–0.7 mm thick, sparsely covered with urticating trichomes; columella 2.5–3 mm long, persistent, with 3 perpendicular apical arms 1–1.5 mm long; seeds 3, subglobose, 4.5–4.9 mm diam., pale brown with paler branched striations and darker brown markings, inner surface somewhat obtusely angular.

Distribution. Known only from lowland rainforest of the upper Orinoco Basin and Río Casiquiare in Amazonas, Venezuela.

While considered as belonging to *Tragia* on the basis of the combination of slender, entire, mostly free styles, glabrous staminate receptacle, twining habit, and urticating trichomes, *T. guayanensis* is unique in that genus in having 5-colpate pollen (Figs. 1, 2) and an elongate staminal column (Fig. 7b). Pollen of all other examined species of *Tragia* is 3-colpate, weakly 3-aperturate, or inaperturate (Gillespie, 1994), with the exception of *T. rubiginosa* Huft, which is 4-colpate (pers. obs.). *Tragia* typically has stamens that are free or fused only at their base (e.g., Fig. 8d). Several species have connate or partly connate stamens, but none have an elongate staminal column; for example, *T. nigricans* Bush (sect. *Tragia*) has filaments connate for one-third to one-half of their length (Miller & Webster, 1967) and *T. scandens* (Baillon) Mueller Argoviensis (monotypic section *Lassia* of Madagascar) has stamens connate into a very short, broad disclike structure (Baillon, 1858: pl. 4, figs. 24, 25; pers. obs.).

Tragia guayanensis is a distinct species of *Tragia*, apparently not closely related to any other. While the vast majority of New World *Tragia* species can be easily placed to section, *T. guayanensis*, along with *T. rubiginosa* of Amazonian Peru and *T. biflora* Urban of Hispaniola, cannot. These three species share unisexual, racemose inflorescences (with staminate inflorescences axillary and pistillate ones terminal but appearing leaf-opposed), while all other New World species have bisexual inflorescences (some African species also have unisexual racemose inflorescences, but these appear distantly related based on other floral characters such as pinnatifid pistillate sepals). *Tragia guayanensis* and *T. rubiginosa* also share multicolpate pollen, but differ considerably in floral morphology indicating that the two species are probably not closely related. *Tragia rubiginosa* is distinguished by its sessile anthers and broad subsessile stigmas and is unique in *Tragia* in lacking distinct styles. Huft (1989) suggested a possible relationship with *T. biflora*, a species considered by Liogier (1971) to be intermediate between *Tragia* and *Platygyna*. One or two new sections will likely be necessary to accommodate *T. rubiginosa* and *T. biflora* if they are retained within *Tragia*.

Species of *Tragia* are few and rare in the Amazon and upper Orinoco basins, but the recent discoveries of *T. guayanensis* and *T. rubiginosa* indicate that this area harbors some of the most unusual and phylogenetically interesting species of the genus.

Paratypes. VENEZUELA. **Amazonas:** rapids of Trapichote, Delta of Ventuari, 124 m, 21 Apr. 1942, *Williams 14990* (F, US).

Tragia (sect. *Tragia*) **tabulaemontana** L. J. Gillespie, sp. nov. TYPE: French Guiana: Sommet Tabulaire, zone centrale, versant ouest, 600 m, ca. 40 km SE de Saül, 28 Aug. 1980, *Granville 3637* (holotype, US; isotype, CAY). Figures 3, 4, 6, 8, 10.

Herba volubilis. Caules petioli et axes inflorescentiae trichomatibus glanduliferis longistipitatis et trichomatibus urentibus brevioribus obsiti. Folia oblanceolata vel anguste elliptica sparsim hirsuta basi anguste cordata. Inflorescentia racemosa bisexualis basi flore femineo unico. Sepala masculina 3; stamina 3 apicem versus tenuia basi valde dilatata. Sepala feminea 6 integra; ovarium trichomatibus urentibus et glanduliferis longistipitatis dense obsitum; styli laeves recurvi longitudine ⅔ connati.

Twining vine, monoecious; indumentum of long-stipitate glandular trichomes 0.5–1 mm long, urticating trichomes 0.2–0.5 mm long, and simple trichomes; stems slender, puberulous, sparsely hirsute with scattered glandular and urticating trichomes. Leaves alternate, simple; stipules triangular, 2–3 mm long; petiole 0.8–3.2 cm long, puberulous, hir-

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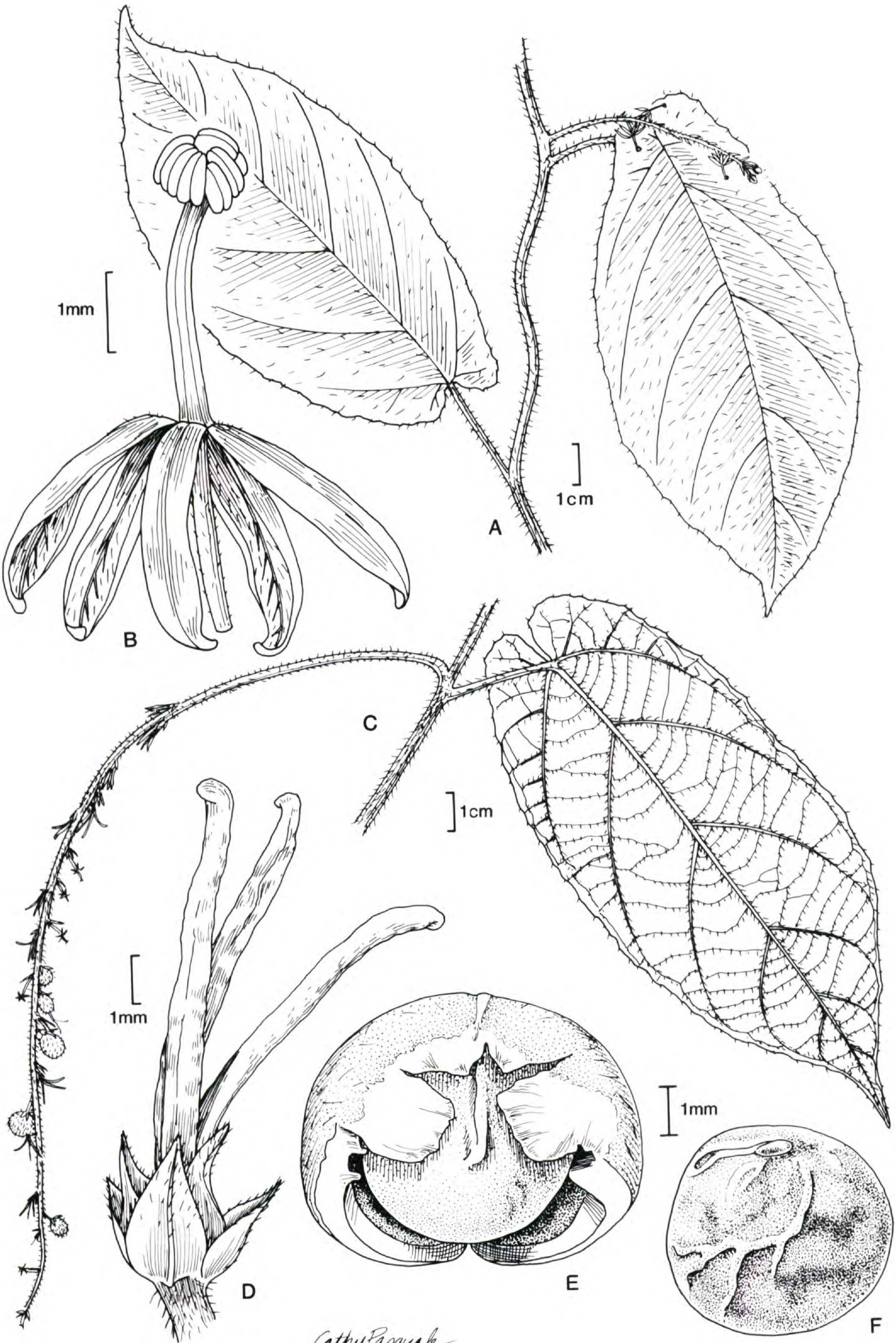
3576, CAY) showing puberulous axis with long-stipitate glandular hairs and shorter urticating hairs; note base of bract at right. Scale bar = 10 μm in Figures 1–4, bar = 0.2 mm in Figures 5, 6.



Cathy Pasquale

sute with scattered glandular and urticating trichomes; blade thin-chartaceous, 5–14 × 2–5.5 cm, narrowly obovate or narrowly elliptic, apex acuminate with acumen 5–12 mm long, base narrowly cordate with sinus 2–6 mm deep, margin serrate with serration apex obtuse and minutely glandular, sparsely hirsute on both surfaces with trichomes ca. 1 mm long, major veins puberulous on upper surface; venation pinnate, secondary veins in 5–7 pairs, irregularly semicraspidodromous, alternate or subopposite on each side of midrib with basal pair opposite diverging at a more acute angle than upper veins, tertiary and quaternary veins reticulate; petiolar and laminar glands absent. Inflorescence slender, racemose, 4–9 cm long, bisexual, terminal and appearing leaf-opposed or terminal on short shoots; axes puberulous, with numerous glandular trichomes and few scattered urticating trichomes; peduncle 1.3–2.2 cm long, single pistillate flower at basal node, staminate flowers numerous above, 1 per node; bracts narrowly triangular-ovate, 1–1.4 mm long, with scattered glandular trichomes, hirsute at apex. Staminate pedicel 1–1.7 mm long, puberulous; bud broadly ovoid, ca. 1 mm long, obtuse at apex; sepals 3, very broadly ovate, 1–1.2 mm long and wide, sparsely hirsute particularly along margin and at apex, sometimes with glandular trichomes; corolla absent; disclike structure obtuse-triangular or 3-lobed in outline, intrastaminal, adnate to dilated base of stamens; stamens 3; filaments 0.5–0.6 mm long, slender and curved upwards at apex, highly dilated at base; anthers 0.2–0.3 mm long, latrorse; pollen oblate-spheroidal, 33–38 μm in equatorial diameter, 28–33 μm in polar diameter, tricolpate, colpus with uneven margins and islands of sexine on apertural membrane, exine intectate-baculate with baculae often coalesced forming irregularly shaped islands, surface microverrucate. Pistillate pedicel ca. 1 mm long, puberulous and with glandular trichomes; sepals 6, lanceolate, ca. 2 mm long, puberulous, hirsute at apex, with glandular trichomes along margin; ovary 3-lobed, ca. 1 × 1.8 mm, 3-locular with 1 ovule per locule, densely covered with urticating and glandular trichomes; styles 3, connate ca. two-thirds of length into column, 1.7–2 mm long; style arms 1–1.4 mm long, recurved, with smooth stigmatic surface. Fruiting pedicel 2–6 mm long; sepals persistent, reflexed; capsule 3-lobed, ca. 4.5 × 7–8 mm, dehiscing into 3 bivalved mericarps, each mericarp 4–4.5 mm long and thick, 6–7.5 mm wide; pericarp woody, ca. 0.3–0.6 mm thick, sparsely covered with urticating trichomes and sometimes glandular trichomes; columella ca. 3 mm long, persistent, with 3 perpendicular apical arms 2–2.4 mm long. Seeds 3, subglobose, 3.8–4 mm diam., pale dull yellow with brown or yellowish brown blotches.

Distribution. Known only from Sommet Tabulaire in French Guiana, where it has been collected in submontane forest on the southern and western slopes.

Tragia tabulaemontana belongs to the neotropical section *Tragia*, which is distinguished by racemose bisexual inflorescences, entire pistillate sepals, tricolpate pollen with an unusual baculate sexine (Figs. 3, 4; Gillespie, 1994: figs. 64–66), and usually three staminate sepals and stamens. Relationships among taxa within this large section are poorly known. *Tragia tabulaemontana* appears to belong to a group that includes *T. chlorocaulon* Baillon, *T. friesii* Pax & K. Hoffmann, *T. karsteniana* Pax & K. Hoffmann, *T. mexicana* Mueller Argoviensis, and *T. tristis* Mueller Argoviensis and which corresponds approximately to Mueller's section *Ratiga* (which is included within sect. *Tragia* by Miller & Webster (1967), Mulgúra & Gutiérrez (1989), and Gillespie (1994)). This species group is characterized by having conical stamens that are slender above and highly dilated at their base, a smooth stylar stigmatic surface, glandular trichomes, and unlobed leaves. *Tragia tabulaemontana* may be distinguished by having oblanceolate or narrowly elliptic leaves that are narrowly cordate at their base (Fig. 10) and long-stipitate glandular trichomes on petioles, inflorescence axes, pistillate sepals, and ovaries (Fig. 6).

The small triangular structure found between the stamens (Fig. 8d) appears to be an intrastaminal disc, although its exact nature is uncertain. Similar structures are found in other species of section *Tragia* and have been interpreted as either pistillodes (Pax & Hoffmann, 1919; Miller & Webster, 1967) or nectaries (Gutiérrez & Mulgúra, 1986). Interpretation as a disc is preferred since the structures appear glandular and possibly nectariferous in some species (e.g., *T. tristis*) and, while discs or disc segments are found elsewhere in tribe Plukenetieae,

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Figure 7. *Tragia guayanensis* L. J. Gillespie. —A. Habit showing staminate inflorescence. —B. Staminate flower. —C. Habit showing infructescence. —D. Pistillate flower. —E. Mericarp of dehisced capsule with enclosed seed. —F. Seed, lateral view. (A, B based on *Stergios & Aymard 9182*, MO; C–F based on *Stergios & Aymard 9182*, NY.)

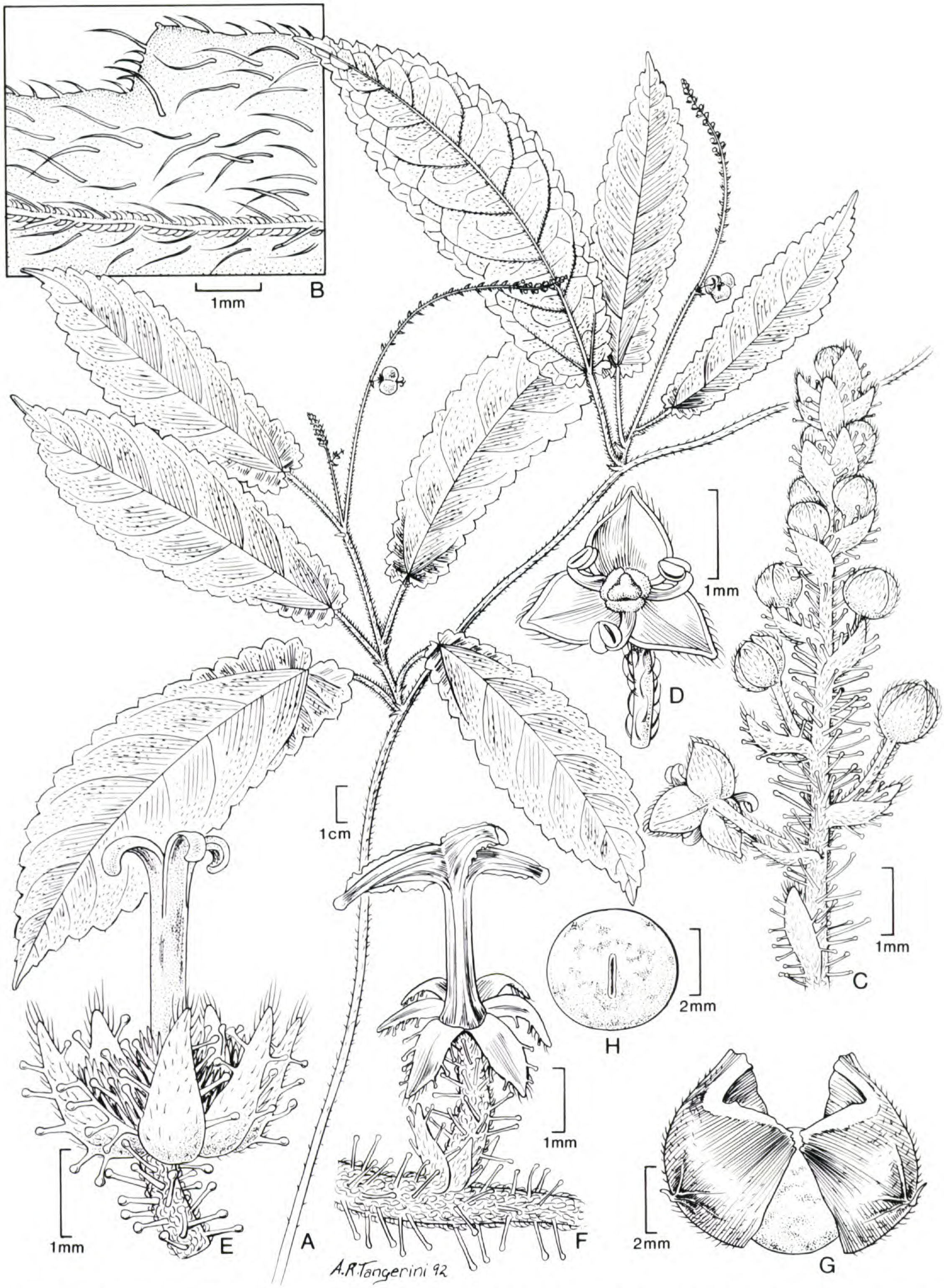
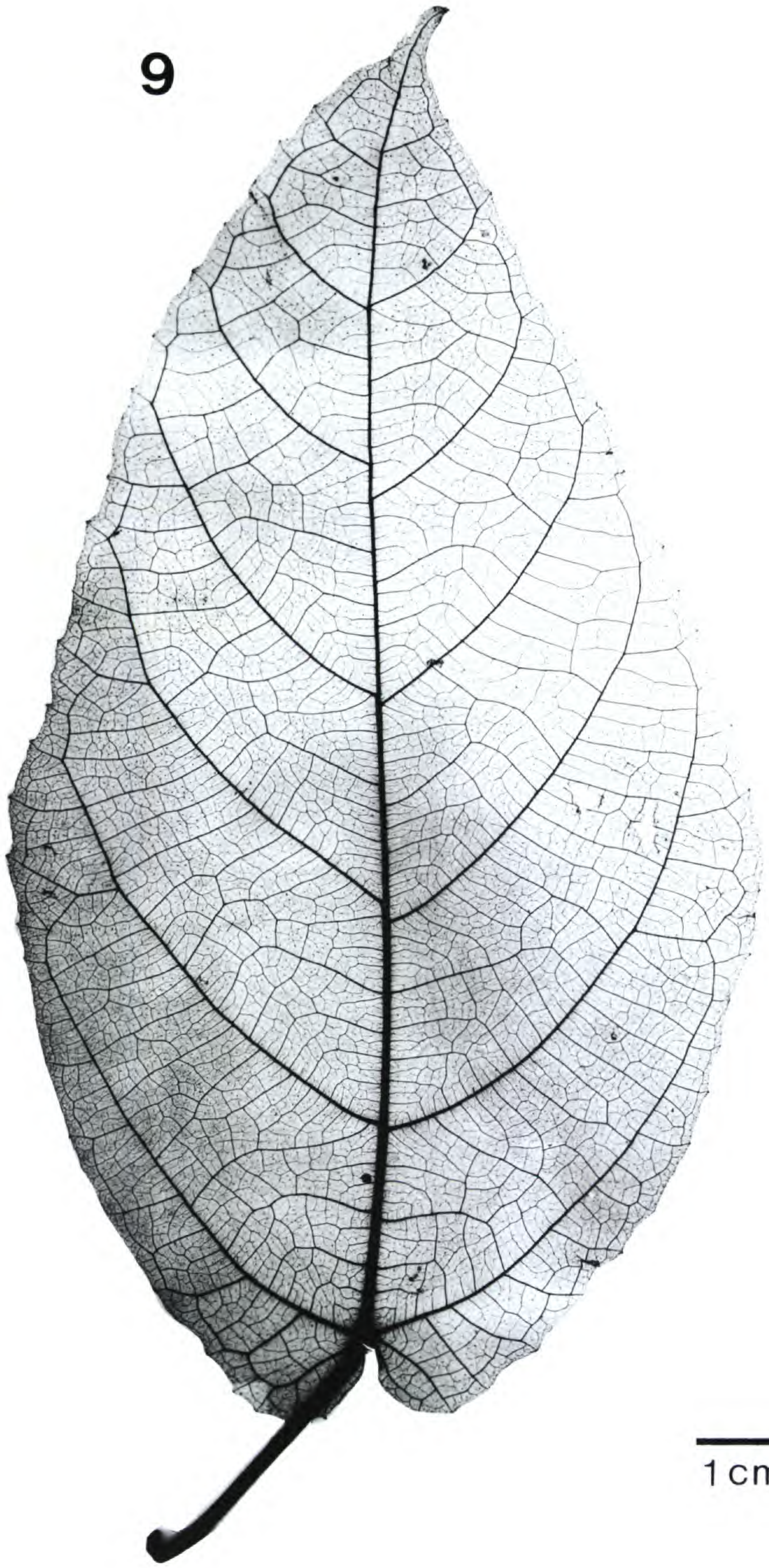


Figure 8. *Tragia tabulaemontana* L. J. Gillespie. —A. Habit. —B. Leaf blade adaxial surface. —C. Upper part of inflorescence with single open staminate flower with staminate buds above. —D. Staminate flower. —E. Pistillate flower. —F. Columella and sepals persistent on infructescence axis following capsule dehiscence. —G. Mericarp of dehisced capsule with enclosed seed. —H. Seed, ventral view. (A–E based on *Granville 3637*, US; F based on *Granville 3576*, CAY; G and H based on *Granville 3637*, CAY.)



Figures 9, 10. Leaf architecture of *Tragia* (leaf X-rays). —9. *T. guayanensis* (*Williams 14990*, US). —10. *T. tabulaemontana* (*Granville 3576*, US).

obvious pistillodes are not. *Tragia tabulaemontana* and the widespread weedy species *T. volubilis* L. are the only species of section *Tragia* known from the Guayana Region including French Guiana. The section is most diverse in lowland dry tropical or subtropical regions of the New World and few species are known from wet tropical regions. *Tragia tabulaemontana* is unusual in being apparently restricted to moist or wet submontane forest.

Paratypes. FRENCH GUIANA. Sommet Tabulaire, versant sud, ca. 50 km SE de Saül, 550 m, 23 Aug. 1980, *Granville 3576* (CAY, U, US).

KEY TO THE SPECIES OF *TRAGIA* IN THE GUAYANA REGION

1. Inflorescence unisexual, racemose; staminate sepals 5; stamens ca. 5, filaments connate into a central elongate column bearing a cluster of sessile anthers (sect. *Monadelphae*) ..... *T. guayanensis*
1. Inflorescence bisexual, racemose or branched; staminate sepals 3(–4); stamens 1–3 or 8–17, free or connate only at the base 2
2. Stamens 7–17; inflorescence appearing dichotomous, consisting of staminate main axis to 18 cm long and a pistillate basal branch to 10 cm long; capsule pedicel 1–4 mm long (sect. *Bia*) 3
2. Stamens 1–3; inflorescence racemose, to 10 cm long, with 1 (or 2) pistillate flower(s) at the basal node(s); capsule pedicel 1–40 mm long (sect. *Tragia*) 4
3. Leaf blade palmately veined, base cordate; stamens 7–10 ..... *T. fendleri* Mueller Argoviensis
3. Leaf blade pinnately veined, base acute or obtuse; stamens 14–17 ..... *T. lessertiana* (Baillon) Mueller Argoviensis
4. Glandular trichomes present on stems, petioles, and inflorescences; inflorescence 4–9 cm long; capsule pedicel less than 0.5 cm long ..... *T. tabulaemontana*
4. Glandular trichomes absent; inflorescence 1–4 cm long; capsule pedicel 1.5–4 cm long ..... *T. volubilis*

Acknowledgments. I thank Kenneth Wurdack for locating specimens of *T. guayanensis* and recognizing them as an undescribed and unusual species of *Tragia*. Research was supported by the Smithsonian Institution's Biological Diversity of the Guianas Program. This study is publication no. 13 in the series "Biological Diversity of the Guianas."

Literature Cited

Baillon, H. E. 1858. Étude générale du groupe des Euphorbiacées. Victor Masson, Paris.

Gillespie, L. J. 1993. Euphorbiaceae of the Guianas: Annotated species checklist and key to the genera. Brittonia 45: 56–94.

———. 1994. Pollen morphology and phylogeny of the tribe Plukenetieae (Euphorbiaceae). Ann. Missouri Bot. Gard. 81: 317–348.

Gutiérrez de Sanguinetti, M. M. & M. E. Mulgúra de Romero. 1986. Una nueva especie de *Tragia* (Euphorbiaceae). Darwiniana 27: 491–497.

Huft, M. J. 1989. New and critical taxa of Euphorbiaceae from South America. Ann. Missouri Bot. Gard. 76: 1077–1086.

Liogier, A. H. 1971. Novitates Antillanae IV. Euphorbiaceae. Mem. New York Bot. Gard. 21: 123–133.

Miller, K. I. & G. L. Webster. 1967. A preliminary revision of *Tragia* (Euphorbiaceae) in the United States. Rhodora 69: 241–305.

Mori, S. A. 1991. The Guayana Lowland Floristic Province. Compt. Rend. Sommaire Séances Soc. Biogéogr. 67: 67–75.

Mulgúra de Romero, M. E. & M. M. Gutiérrez de Sanguinetti. 1989. Actualización taxonómica de *Tragia* (Euphorbiaceae) para Argentina y regiones limítrofes. Darwiniana 29: 77–138.

Pax, F. A. & K. Hoffmann. 1919. Euphorbiaceae–Plukenetiinae. *In:* A. Engler (editor), Das Pflanzenreich IV.147.XI.(Heft 68): 1–108. W. Engelmann, Leipzig.

New Taxa and Revisions to the Taxonomy of Southern African *Lapeirousia* Subgenus *Lapeirousia* (Iridaceae subfamily Ixioideae)

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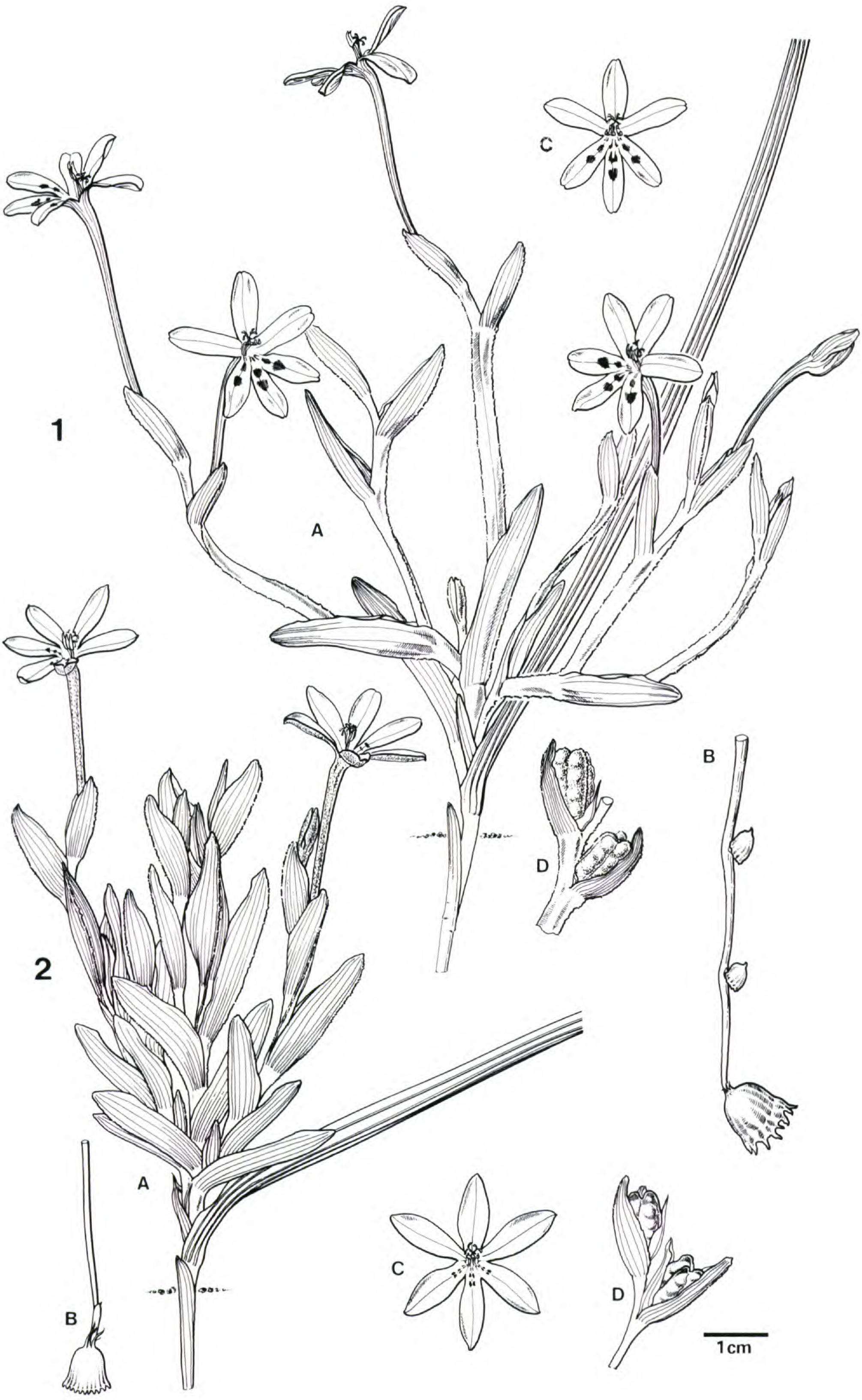
ABSTRACT. Studies of the pollination biology of the southern African species of *Lapeirousia* subg. *Lapeirousia* have indicated the need for several taxonomic changes in the alliance. *Lapeirousia simulans* is a new species, until now confused with *L. arenicola*, a fairly widespread species of the Cape west coast: *L. simulans* occurs sympatrically with *L. arenicola*, but subtle differences in flower patterning, capsule and seed morphology, and bract size separate the two. New evidence indicates that varieties *spinosa* and *tenuis* of *L. divaricata* should both be treated as separate species, and they are recognized here as *L. spinosa* and *L. tenuis*. The former is an allopatric vicariant of *L. divaricata*, differing in its compact growth form and larger flowers. *Lapeirousia tenuis*, however, appears to be more closely related to *L. dolomitica*, from which it differs in flower size, tepal color, and length of the perianth tube. Examination of living plants matching the type of *L. macrospatha* indicates that the species was incorrectly treated as conspecific with *L. barklyi*. The two differ consistently in flower color and markings, the length of the perianth tube, and the shape of the floral bracts, and are most likely not immediately related. Lastly, populations of the widespread *L. pyramidalis* with a dark blue, purple, or red perianth, a longer perianth tube, and odorless flowers are segregated here as subspecies *regalis*. Subspecies *regalis* is most likely adapted to a different pollinator than subspecies *pyramidalis*, which has a pale blue, pink, or white perianth, a shorter perianth tube, and a strong floral odor.

The tropical and southern African genus *Lapeirousia* Pourret comprises some 40 species currently segregated in two subgenera (Goldblatt & Manning, 1990, 1992). Subgenus *Lapeirousia*, with 21 species, is centered in the coastal and near interior parts of southwestern Africa but includes two tropical African species (Goldblatt, 1990). Subgenus *Paniculata* Goldblatt & Manning, with 19 species, comprises the largely tropical African section *Paniculata* (14 species), with one species in the southwestern part of southern Africa, and section *Fastigiata* Goldblatt (5 species), restricted to the southwestern Cape region of South Africa (Goldblatt & Manning, 1992). Field studies of the pollination biology of subgenus *Lapeirousia*, conducted over the past two years, have yielded new information about the genus and indicated the need for substantial taxonomic revision.

Sixteen southern African species were included in subgenus *Lapeirousia* by Goldblatt (1972), who then treated it as section *Lapeirousia*. One cryptic species, included in *L. arenicola* Schlechter, is now understood to be a distinct species, here described as *L. simulans*. *Lapeirousia divaricata* N. E. Brown, treated by Goldblatt (1972) as comprising three varieties, is now reconstituted. Variety *spinosa* Goldblatt, raised to species rank as *L. spinosa*, differs consistently from *L. divaricata* in its ecology and morphology and merits separate species status. Variety *tenuis* Goldblatt, now *L. tenuis*, appears to be more closely related to *L. dolomitica* Dinter than to *L. divaricata*. It has broadly conic corms with spiny margins identical to those of *L. dolomitica* and can be distinguished from this species largely by its short-tubed flower with narrow tepals and non-inflated floral bracts.

In the widespread *Lapeirousia pyramidalis* (Lamarck) Goldblatt, patterns of floral variation suggest the need for the recognition of two subspecies. Typical subspecies *pyramidalis* has strongly scented white, pale blue, or pale pink flowers with a perianth tube of intermediate length. What we recognize here as subspecies *regalis* is restricted to the northwestern Cape and has darkly pigmented, red, purple, or violet flowers with a long perianth tube and no scent. Lastly, it is now apparent that *L. barklyi* Baker and *L. macrospatha* Baker were incorrectly united by


1
A
C
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Goldblatt (1972). On the basis of floral morphology *L. macrospatha* appears to be most closely related to *L. arenicola* and shares with it hypocrateriform, cream-colored flowers with reddish markings and long floral bracts. *Lapeirousia barklyi*, however, has lilac to purple flowers with shorter perianth tubes, and shorter floral bracts. It appears to be most closely allied to *L. fabricii*. Both the latter have apomorphic flowers with the tepals cupped at the base and large, ridged, toothlike calluses on the lower tepals.

The addition of three new species, and the recognition of one more raised from synonymy, brings the total species in subgenus *Lapeirousia* to 21. All the additional species are restricted to the west coast and near interior of the Cape Province, South Africa, a region known as Namaqualand. This area of semi-arid climate and low, but almost exclusively winter rainfall is evidently an even more important center of speciation for the subgenus than was apparent in the past. Fifteen of the 21 species of the subgenus occur here, and 10 of these are either widespread or narrow endemics of the area.

1. Lapeirousia simulans Goldblatt & Manning, sp. nov. TYPE: South Africa. Cape: Knersvlakte, 10 km N of Vanrhynsdorp, 14 Sep. 1992, *Goldblatt & Manning 9454* (holotype, NBG; isotypes, K, MO, PRE, WAG). Figure 1.

Plantae 10–18 cm altae, cormo infra leviter dentato, campanulato 7–8 mm diametro, spicis (2–)3–5 florum, floribus albescentibus tepalis inferioribus rubris notatis, tubo perianthii ca. 30 mm longis cylindricis, tepalis inaequalibus superioribus tribus majoribus, dorsalis ca. 11 × 4 mm, inferioribus 10 × 3–3.3 mm, filamentis 5–6 mm longis, antheris 2–2.5 mm longis contiguis, stylo infra bases antherarum diviso, ramis styli ca. 2 mm longis divisis ad dimidium, capsulibus 8–10 mm longis verrucosis.

Plants 10–18 cm high. *Corm* campanulate, 7–8 mm diam., 6–9 mm below ground, the tunics dark brown, glossy, the base lightly serrate, the teeth directed downward. *Leaves* 3 or more, the lowermost longest, usually about twice as long as the stem, linear, 2–4.5 mm wide, ribbed (corrugate), remaining leaves progressively shorter above, becoming ± bractlike and usually subtending a branch. *Stem* compressed and 2-angled, the angles irregularly minutely serrate, 2–3(–5)-branched (rarely simple), the branching divaricate, below ground bearing a cormlet at each of the two subterranean nodes. *Inflorescence*(*s*) lax spikes of (2–)3–5 flowers; *outer bracts* green, transparent on the veins, keeled, the keels decurrent on the stem angles, lightly serrate, 10–18 mm long; *inner bracts* about half as long as the outer. *Flowers* zygomorphic, whitish, reddish brown on the reverse, the lower 3 tepals each with a small filiform tooth near the base, and with a small basal and larger median dark red spot, unscented; *perianth tube* cylindric, 27–30(–33) mm long, slightly wider and curved near the apex; *tepals* unequal, the upper 3 slightly larger than the lower, when fully open all held ± horizontally, and at right angles to the tube, ca. 11 × 4 mm, the lower 3 held closely together, 10 × 3–3.3 mm. *Filaments* unilateral, erect, 5–6 mm long, exserted ca. 3 mm from the tube; *anthers* 2–2.5 mm long, purple, the pollen purple. *Ovary* oblong, ca. 3 mm long; *style* erect, held adaxial to the stamens, dividing between the mouth of the tube and the bases of the anthers, the branches ca. 2 mm long, divided for slightly more than half their length. *Capsules* oblong, 8–10 mm long, lightly verrucate in the upper half, without auriculate apices or locular ridges; *seeds* globose, yellow-brown, ca. 16 mm diam., regularly colliculate (the cells fairly small).

Flowering early to late September, occasionally in late August.

While searching for the insect pollinators of *Lapeirousia arenicola*, a fairly common species of sandy soils in the Knersvlakte north of Vanrhynsdorp, we noted that tall plants with a more open branching system and shorter bracts than normal for the species also had corms particularly deeply buried in the sand. These plants consistently had a large cormlet at each of two subterranean nodes of the stem (Fig. 1B). Plants corresponding to our interpretation of *L. arenicola*, co-occurring with the taller, cormlet-bearing individuals, are compact, have larger bracts, and shallowly buried corms, and the underground part of the stem always lacks cormlets (Fig. 2B). Flowers of the two plants are virtually identical in their shape, color, and markings, and differ only slightly in size (Figs. 1, 2). Additionally, typical *L. arenicola* seems to begin flowering earlier in the

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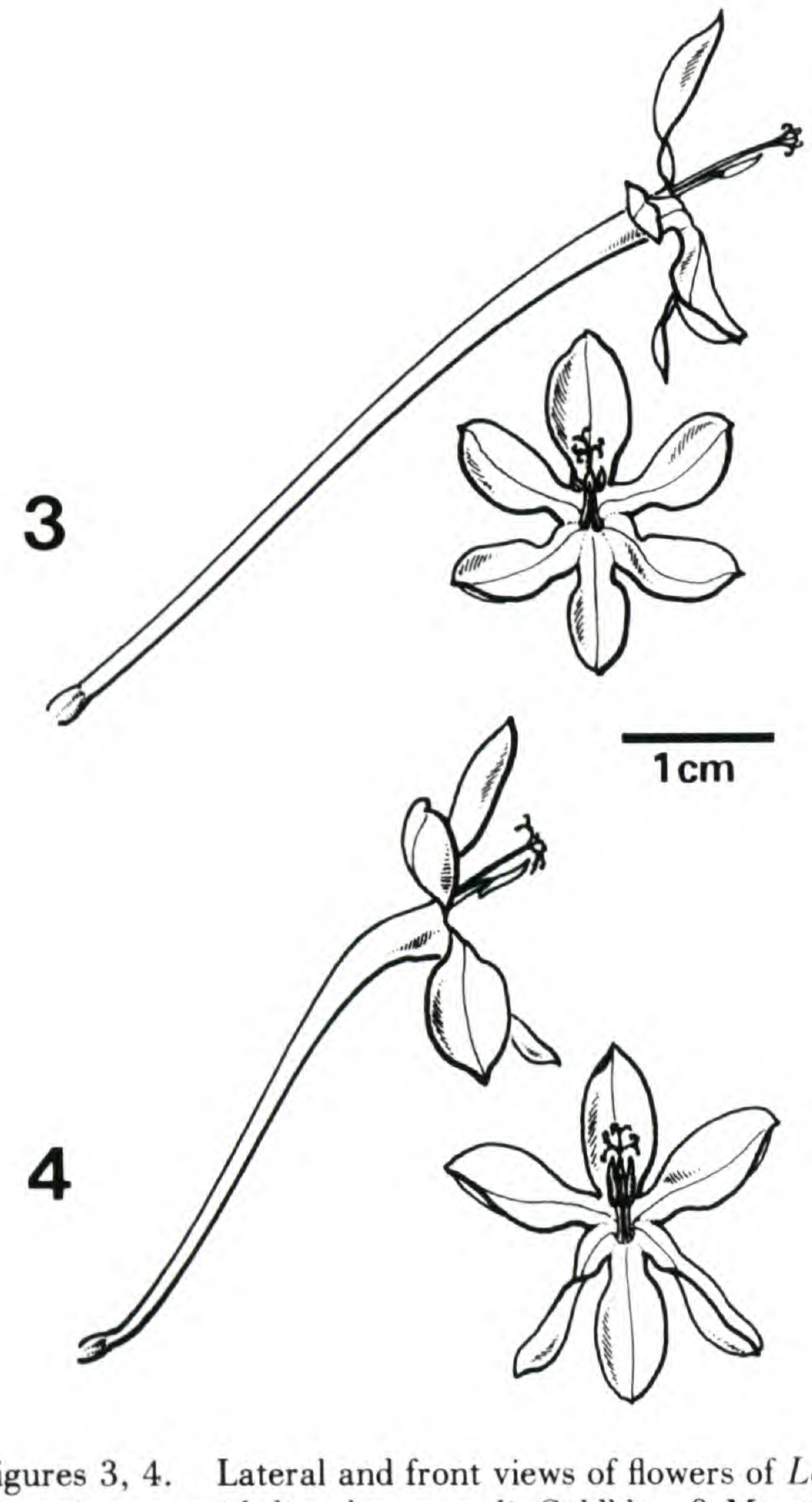
Figures 1, 2. 1. *Lapeirousia simulans* Goldblatt & Manning. —A. Whole plant. —B. Corm and underground part of the stem, showing a cormlet at each underground stem node. —C. Front view of flower. —D. Mature capsules. 2. *Lapeirousia arenicola* Schlechter. —A. Whole plant. —B. Corm and underground part of the stem (without cormlets). —C. Front view of flower. —D. Mature capsules. (Drawn by J. C. Manning.)



Figures 3, 4. Lateral and front views of flowers of *Lapeirousia pyramidalis* subsp. *regalis* Goldblatt & Manning (3) and subspecies *pyramidalis* (4).

season. By the time the taller, less compact plants come into bloom, the flowers of *L. arenicola* have shorter tubes and shorter styles and are less brightly colored than earlier in the season.

We conclude that the taller, less compact, and later-flowering plants represent a second species, until now confused with *Lapeirousia arenicola*. Examination of available herbarium specimens reveals a few collections of what we here describe as *L. simulans*, all identified as *L. arenicola*, from the same general area north of Vanrhynsdorp, and from near Vredendal to the west. *Lapeirousia arenicola* has a wider range and extends through the coastal hills and coastal plain of Namaqualand to the edge of the Richtersveld, near Anenous Pass. Subsequently, we found that the capsules and seeds of the two species also differ. The capsules of *L. arenicola* are oblong, (8–)10–12 × 6 mm, and the apices have auriculate lobes decurrent on raised ridges on the upper half of the locules (Fig. 2D). The seeds are ca. 1.4 mm in diameter and have epidermal cells of the usual size for subgenus *Lapeirousia*. The capsules of *L. simulans* (Fig. 2D) are usually smaller, 8–10 mm long; are verrucate in the upper half; lack auricular apical lobes or locular ridges; and the seeds, ca. 1.6 mm in diameter, have unusually small epidermal cells.

Because *Lapeirousia arenicola* and *L. simulans* are so similar in their flowers, we have considered the possibility that they are merely morphs of a single species, one adapted to early flowering and with a more compact habit and shallower corms, and the other to late flowering and with a less compact habit and deeply seated corms. Such intraspecific and sympatric dimorphism is unknown in Iridaceae and seems to us unlikely here, especially in view of the differences between the capsules and seeds.

Paratypes. SOUTH AFRICA. **Cape:** 3018 (Vanrhynsdorp) 3 km N of Vredendal, sandveld, 16 Sep. 1970 (DA), *Hall 3818* (NBG); Vanrhynsdorp, 2 Sep. 1951, *Martin 825* (MO, NBG); 1.5 km NW of Vredendal (Cohen's farm), 8 Sep. 1970, *van der Merwe 151* (BOL, STE); ca. 10 km N of Vanrhynsdorp, 20 Aug. 1993, *Goldblatt & Manning 9609* (MO, NBG), 10 Sep. 1993 (fr), *Goldblatt & Manning 9701* (MO, NBG).

2. Lapeirousia pyramidalis subspecies **regalis** Goldblatt & Manning, subsp. nov. TYPE: South Africa. Cape: Middelplaas, ca. 5 km from farm Bidouw on the Wuppertal road, 8 July 1941, *Leipoldt 3866* (holotype, BOL; isotype, NBG). Figure 3.

Plantae similes subspecie *pyramidali* sed floribus rubris, purpureis, violaceis, vel atrocaeruleis, inodoratis, tubo perianthii (36–)40–50(–55) mm longo cylindraceo, tepalis subaequalibus, 10–12 mm longis, capsulis oblongis, seminibus tuberculatis.

Plants resembling the typical subspecies vegetatively and in the inflorescence and floral bracts. *Flowers* red, purple, violet, or navy blue, the lower tepals with cream markings on the claws and darker blue or red markings in the middle of the limbs, unscented; *perianth tube* (36–)40–50(–55) mm long, cylindric and straight throughout; *tepals* subequal, 10–12 mm long, the dorsal held somewhat apart from the others when fully open. *Stamens* and *style* as in subspecies *pyramidalis*. *Capsules* oblong-trigonous, the locules with prominent ridges, 7–9 mm long; *seeds* globose, smooth in profile, 10–12 mm diam., the epidermal cells in straight files, the outer periclinal walls domed and lightly tuberculate.

Flowering late July to early September.

Lapeirousia pyramidalis, one of the more widespread species of subgenus *Lapeirousia*, extends

from the southern edge of Namaqualand through dry areas of the northwestern Cape, to the Little Karoo and southern Cape (Goldblatt, 1972). Over much of its range it has a fairly consistent facies. Plants are compact and have broadly obtuse floral bracts. The flowers are pale blue or pale pink to lilac and have a perianth tube (16–)25–35 mm long, slightly curved and wider in the upper 5–7 mm (Fig. 4), and always strongly scented, both during the day and in the evening. In the west of its range, in the Olifants and Bidouw River valleys, and also at Karoopoort, to the south, plants corresponding to *L. pyramidalis* in general form, including the broadly obtuse floral bracts, have bright red, purple, or dark violet flowers, with a long, nearly straight perianth tube, 36–55 mm long (Fig. 3), and no discernible odor. The floral differences strongly indicate a shift in pollination strategy (Goldblatt et al., in prep.).

The two forms are too similar to be recognized as separate species but are sufficiently distinct morphologically to merit taxonomic recognition as subspecies. We propose to name the plants with darkly pigmented and long-tubed, unscented flowers subspecies *regalis*. As far as we know, the two subspecies are geographically separate and favor different habitats (and presumably are pollinated by different insects). Subspecies *pyramidalis* normally grows on shale and clay soils, but subspecies *regalis* has only been recorded on sandstone-derived stony sand.

A second variant of *Lapeirousia pyramidalis* occurs in the Knersvlakte in southern Namaqualand. This is the plant, *L. angustifolia*, named by Rudolf Schlechter in 1896. Regarded by Goldblatt (1972) as conspecific with *L. pyramidalis*, largely on the basis of shared apomorphic bracts with broadly obtuse apices, it also has an unusually short perianth tube for *L. pyramidalis*, some 16 mm long, and the white flowers have a light scent, rather different from that in typical subspecies *pyramidalis*. Flowers of typical *L. pyramidalis* subsp. *pyramidalis* are occasionally white, but more often pale blue or pale pink to lilac, are always strongly scented, and have perianth tubes usually 25–35 mm long. In addition, the seeds of *L. angustifolia* are apparently lightly rugulose and the cell surfaces are colliculate. This is different from the smooth seeds of *L. pyramidalis*, entirely without primary sculpturing, and with tuberculate cell surfaces (Goldblatt & Manning, in prep.). It is, however, difficult to separate *L. angustifolia* from *L. pyramidalis* in the herbarium, and the two appear to intergrade. Provisionally, we are adopting the working hypothesis that plants matching *L. angustifolia* are depauperate *L. pyramidalis*, in which seasonal conditions are such that the typical characters of the species are not always fully developed (tube length, strong scent, seed sculpturing, etc.). Although differences in seed morphology seem to be important in *Lapeirousia* (Goldblatt & Manning, in prep.), we conclude that *L. angustifolia* should continue to be regarded as a local variant of *L. pyramidalis*. Populations in the Knersvlakte need to be compared in poor and particularly good seasons to determine year to year variation in critical taxonomic characters.

Paratypes. SOUTH AFRICA. **Cape:** 3118 (Vanrhynsdorp) Olifants River Barrage (DD), 22 July 1941, *Esterhuysen 5377* (NBG). 3318 (Clanwilliam) ca. 15 km (9 mi.) N of Clanwilliam (BB), 22 Aug. 1950, *Barker 6420* (NBG); between Nardouwskloof and Bulshoek, 12 Aug. 1976, *Goldblatt 3837* (MO); near Clanwilliam, Aug. 1945, *L. Bolus s.n.* (BOL 23183). 3219 (Wuppertal) top of Bidouw valley between Blinkvlei and the Doorn River (AB), 23 July 1961, *Lewis 5824* (NBG). 3319 (Worcester) Karoopoort (BA), 30 July 1950, *Hall 282* (NBG); Karoopoort, 26 Aug. 1935, *Compton 5409* (BOL, NBG).

3. Lapeirousia spinosa (Goldblatt) Goldblatt & Manning, comb. et stat. nov. Basionym: *Lapeirousia divaricata* var. *spinosa* Goldblatt, Contrib. Bolus Herb. 4: 66. 1972. TYPE: South Africa. Cape: Richtersveld, plains W of Anenous Pass, ca. 68 km W of Steinkopf on the Port Nolloth road, 24 Sep. 1970, *Goldblatt 567* (holotype, BOL).

Plants 5–9(–14) cm high. *Corm* campanulate, 9–15 mm diam., 2–4 cm below ground, the tunics blackish, often glossy, basal margin with horizontally directed spines. *Foliage leaves* 3–4 (or more if plants branched), the lowermost usually conspicuously longer than the others, linear to narrowly lanceolate and ascending or falcate, 2–4 mm wide, strongly ribbed (corrugate), usually slightly longer than the stem, remaining leaves shorter and progressively more bractlike and the ribs weakly or not at all developed. *Stem* erect, simple or branched, the branching always near the base, somewhat compressed but not normally angled, without cormlets at the below ground nodes. *Inflorescences* spikes of (3–)5–9 flowers, usually fairly crowded; *outer bracts* green or flushed reddish below, firm, 12–20(–35) mm long, enclosing the slender part of the tube, green, the veins transparent, margins narrowly hyaline, channeled below, lightly keeled in the upper half, the keels minutely serrate or crisped, the inner bracts half to less than half as long as the outer, 2-veined and 2-keeled, with broad hyaline transparent margins. *Flowers* zygomorphic, white or sometimes flushed with pink to lilac (more so with

age and in dry material), the lower tepals yellow below and each with one or two median purple marks near the base of the limb and bearing a toothlike callus ca. 2 mm long at the base; *perianth tube* short, 9–12 (less in dried material) mm long, narrow below, curved and widening above; *tepals* unequal, lanceolate and acute, the dorsal largest, 18–23 × 6–8 mm, erect and held apart from the other tepals, the lower margins undulate or lightly crisped, upper lateral tepals united with the lower 3 for ca. 5 mm, the claws directed forward, the limbs reflexed, the lower 3 tepals horizontal below, and each with a median toothlike ridge, limbs 12–14 × 6–8 mm, flexed sharply downward at ca. 45°, the margins of the claws undulate. *Filaments* unilateral, 11–12 mm long, exserted 7–9 mm from the tube; *anthers* 4–6 mm long, white, the pollen white. *Ovary* oblong, ca. 3 mm long; *style* arching over the stamens, dividing opposite the base to middle of the anthers, the branches ca. 5 mm long, forked for ca. two-thirds their length, recurved. *Capsules* ovoid, 6–7 mm long, with auriculate lobes above the locules; *seeds* globose, ca. 1.4 mm diam., the surface regularly colliculate.

Flowering late August to mid October at higher elevations.

Lapeirousia spinosa is restricted to the Richtersveld in northern Namaqualand. It occurs on arid sandy flats in light, but fine-grained soil, sometimes in quartzite pebble patches. It is evidently most closely related to *L. divaricata*, a northwestern Cape species of seasonally wet sites such as seeps, stream banks, and drainage lines, always in coarse to medium-grained sandstone-derived soils. *Lapeirousia divaricata* has flowers nearly identical to those of *L. spinosa*, but the plants differ in vegetative appearance. Plants of *L. divaricata* are relatively slender, 12–25 cm tall, the spikes are held well above the leaves, and the branches, when present, are produced well above the ground level. *Lapeirousia spinosa*, however, has a compact habit, reaching 5–9(–14) cm in height, the spikes are borne among the leaves, and the branches are produced close to ground level. The difference in growth form combined with separate distributions and different habitat preferences make it desirable to raise *L. spinosa* to species rank.

The type and other populations of *Lapeirousia spinosa* from the Richtersveld have comparatively large flowers with the perianth tube 10–12 mm long and the dorsal tepal 20–23 mm long. Plants from a few sites to the south, however, have smaller flowers with the perianth tube 9–10 mm long and the dorsal tepal seldom more than 18 mm long. The smaller size suggests that the southern populations may constitute a separate genotype. Additional study of these smaller-flowered plants is needed to better understand the variation in *L. spinosa*. In the specimens cited below, the smaller-flowered collections are marked with an asterisk (*).

Additional specimens examined. SOUTH AFRICA. **Cape:** 2816 (Oranjemund) stony gravel flats near Arrisdrif (DA), 31 Aug. 1925, *Marloth 12389B* (PRE). 2817 (Vioolsdrif) ca. 5 km E of Eksteenfontein, quartzite plain (CD), 1 Sep. 1986, *Williamson 3610* (MO, NBG); near Doorn River, Namaqualand, 10 Sep. 1929, *Herre s.n.* (PRE). 2916 (Port Nolloth) between Port Nolloth and Holgat, Sep. 1929 (BB), *M. Schlechter s.n.* (PRE). 2917 (Springbok) Eksteenfontein road, 3–4 km N of the Port Nolloth road (AB), 8 Sep. 1980, *Goldblatt 5730* (K, LE, MO, NBG, PRE, S); Anenous plains, clay flats 2–6 km along old railway bed W of Grasvlakte farmhouse, 15 Sep. 1992, *Goldblatt & Manning 9456* (K, MO, NBG, PRE, WAG); 8 km W-NW of Vaalheuvel, Stryd River valley (AD), 24 Aug. 1957, *Acocks 19428* (BOL, PRE); stony river valley near Harras House, 24 Aug. 1980, *van Berkel 237* (MO, NBG). 2917 (Springbok) Rooibaken, flats SW of Komaggas (CD), 5 Sep. 1983, **Oliver 8034* (PRE); Komaggas, 9 Sep. 1950, **Barker 6675* (NBG). 3017 (Hondeklipbaai) 4 km from Wallekraal on road to Kamieskroon, 28 Sep. 1976 (BC), **Goldblatt 4246* (MO, NBG, PRE); Wallekraal, 30 Aug. 1935, **Compton 5420* (BOL, NBG). Without precise locality: Namaqualand Minor, Sep. 1883, *H. Bolus 6577* (BOL).
(* denotes smaller-flowered plants.)

4. Lapeirousia tenuis (Goldblatt) Goldblatt & Manning, comb. et stat. nov. Basionym: *Lapeirousia divaricata* var. *tenuis* Goldblatt, Contr. Bolus Herb. 4: 66. 1972. TYPE: South Africa. Cape: between Port Nolloth and the mountains of the interior, Sep. 1883, *H. Bolus 6575* (holotype, BOL; isotypes, K, SAM).

Plants 6–16 cm high. *Corm* campanulate-triangular, 12–15 mm diam. at the base, 1–3 cm below ground, the tunics blackish, the basal margins with fine laterally extended teeth 2–3 mm long, the tunics often accumulating, the margins thus somewhat brushlike. *Foliage leaves* 3–4, only the lowermost well developed, straight and linear or falcate, usually slightly longer than the stem or slightly shorter, 2–3 mm wide, ribbed (corrugate), remaining leaves less than half as long and progressively more bractlike above. *Stem* erect, simple or branched, lightly compressed. *Inflorescences* spikes of 9–16 flowers, the lateral branches with fewer flowers, distichous, becoming spiral; *outer bracts* green or flushed with red pigment, transparent on the veins, acute, 7–11 mm long, the apices curving upward, the inner bracts half to one-third as long as the outer, 2-keeled, the apices forked. *Flowers* zygomorphic, lilac to light purple, the lower tepals each with a filiform cusp

near the base; *perianth tube* 12–15 mm long, slender, curving outward in the upper third; *tepals* subequal, narrowly lanceolate to nearly linear, 9–11 × 1.8–3 mm, the dorsal erect, the upper laterals reflexed, the lower 3 joined to one another for ca. 1.5 mm, evidently extending horizontally. *Filaments* unilateral, ± erect, 5–6 mm long, exserted ca. 2 mm from the tube; *anthers* ca. 3 mm long. *Ovary* ovoid, ca. 3 mm long; *style* arching over the stamens, dividing at mid anther level, the branches ca. 2 mm long, deeply divided. *Capsules* globose-trigonous, ca. 4–5 mm long; *seeds* globose, 1.6–2 mm diam., brown, glossy, regularly colliculate.

Flowering mainly in July, occasionally into mid or late August, and once recorded in flower in early September.

Poorly known and evidently rare, *Lapeirousia tenuis* appears to be restricted to coastal central Namaqualand. Three of the five known collections are from the sandy coastal plain north and east of Kleinzee, suggesting a very local distribution. The remaining two collections lack precise locality data. The earliest collection of the species was made by Harry Bolus on his expedition to Namaqualand in 1883, in the hills east of Port Nolloth (some distance north of Kleinzee). The Namaqualand coast between Port Nolloth and Hondeklipbaai, which lies to the south of Kleinzee, is not well collected, and the distribution of *L. tenuis* may be wider than the present record suggests.

Although when first described *Lapeirousia tenuis* was regarded as a subspecies of *L. divaricata* (Goldblatt, 1972), additional collections of the latter, and of the related *L. spinosa*, also regarded by Goldblatt as a subspecies of *L. divaricata*, make it clear that *L. tenuis* is not closely related to either of these two species. They have in common serrated basal corm tunic margins and comparatively small bracts, but the flowers differ markedly. In both *L. divaricata* and *L. spinosa* the lower tepals are united with the upper laterals for 4–5 mm, and the lower tepals have large ridged calluses. This is not the case in *L. tenuis*, the narrow lower tepals of which spread more or less uniformly from the apex of the perianth tube. The lower tepals are joined for ca. 1.5 mm, but are not fused to the upper tepals at all, and they have inconspicuous cusplike teeth at the bases. It seems probable that *L. tenuis* is most closely related to *L. dolomitica*, at least on the basis of their similar triangular-campanulate corms and the rather fine basal teeth that project from the basal margins of the corm tunics. The two differ notably in the length of the perianth tube and the size of the bracts. In *L. dolomitica* the tube is at least 25 mm long and often 30–50 mm long, and the bracts are 12–20 mm long, whereas in *L. tenuis* the tube is only 10–15 mm long, and the bracts seldom exceed 11 mm and are often considerably shorter.

Additional specimens examined. SOUTH AFRICA. **Cape:** 2917 (Springbok) road from Port Nolloth to Spektakel, 16 km from turnoff, hills covered with quartz pebbles, 24 Sep. 1970 (fr) (AD), *Goldblatt 586* (BOL); 8 km N of Grootmis (Grootmist), 20 Aug. 1952 (CA), *Hall 579* (NBG); 1 km E of the Langhoogte Mine turnoff on Springbok–Kleinzee road, 145 m, 17 Aug. 1980, *van Berkel 196* (MO); sandveld between Grootmist and Springbok, 28 July 1937 (CA–CB), *Verdoorn & Dyer 1882* (PRE). Without Precise Locality: ca. 6 km N of Uguabis (not Uhabis, located NE of Vioolsdrif in Namibia), 6 Sep. 1925, *Marloth 12665* (PRE).

5. Lapeirousia macrospatha Baker, Fl. Cap. 6: 94. 1896.

Material of *Lapeirousia barklyi* and *L. macrospatha* available prior to 1972 included only a limited number of rather poorly preserved herbarium specimens. These suggested that there was a continuous range of bract and perianth tube size and that the types of the two species represented the extremes in the range of variation of a single species (Goldblatt, 1972). *Lapeirousia macrospatha* was thus reduced to synonymy in *L. barklyi* by Goldblatt.

Examination of specimens collected since then and a study of living plants make it clear beyond any possible doubt that *L. macrospatha* and *L. barklyi* are distinct from one another. *Lapeirousia barklyi* typically has a perianth tube of intermediate length, 20–25 mm long, and lilac to purple flowers with reddish markings. The bracts are correspondingly short, (10–)20–25 mm long, and comparatively narrow and acute. By contrast, plants that we attribute to *L. macrospatha* have a perianth tube 30–35 mm long, and a cream perianth, reddish on the reverse and with reddish markings on the lower tepals. The bracts are longer and wider than those of *L. barklyi*, 20–35 mm long, and less acute. In addition, the orientation of the tepals in the two species differs. In *L. barklyi* the upper part of the perianth tube forms a wider throat and the lower 3 tepals have distinct claws that extend upwards to form a cup enclosing the stamens, whereas in *L. macrospatha* the tube is nearly cylindric to the apex and the tepals spread outward from the bases.

Perianth tube morphology and tepal orientation suggest that *Lapeirousia barklyi* is most closely related to *L. fabricii*, a widespread Namaqualand and the northwestern Cape species. *Lapeirousia macrospatha*, however, seems most closely related to *L. arenicola*, which has flowers of similar form

and coloring, although they are substantially smaller in size. Both *L. barklyi* and *L. macrospatha* occur in deep sandy soils, the latter restricted to the Richtersveld, while *L. barklyi* extends from the southern Richtersveld northward into southwestern Namibia. There seems little difference in their habitats, although we have not seen them growing together. Both normally grow in large populations, and in some years appear to be a dominant species in a community of small annuals and scattered low shrubs.

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Literature Cited

Goldblatt, P. 1972. A revision of the genera *Lapeirousia* Pourret and *Anomatheca* Ker in the winter rainfall region of South Africa. Contr. Bolus Herb. 4: 1–111.

———. 1990. Systematics of *Lapeirousia* (Iridaceae–Ixioideae) in tropical Africa. Ann. Missouri Bot. Gard. 77: 430–484.

——— & J. C. Manning. 1990. Leaf and corm tunic structure in *Lapeirousia* (Iridaceae–Ixioideae) in relation to phylogeny and infrageneric classification. Ann. Missouri Bot. Gard. 77: 365–374.

——— & ———. 1992. Systematics of the southern African *Lapeirousia corymbosa* (Iridaceae–Ixioideae) complex (sect. *Fastigiata*) and a new species of sect. *Paniculata*. S. African J. Bot. 58: 326–336.

A New Species of *Galipea* (Rutaceae–Cuspariinae) from Costa Rica and Nicaragua

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ABSTRACT. *Galipea dasysperma* Gómez-Laurito & Q. Jiménez, from the tropical rainforests of Costa Rica and Nicaragua, is described, illustrated, and compared with its closest relatives.

The neotropical genus *Galipea* (Rutaceae–Cuspariinae), comprised of about 10 species, is distributed mainly in northern South America (Elias, 1970; Porter & Elias, 1979; Mabberly, 1987).

Galipea trifoliata Aublet, with trifoliolate leaves, reaches the Darién in southern Panama. *Galipea granulosa* Kallunki, also with trifoliolate leaves, is known from Nicaragua and Costa Rica, and *G. panamensis* Elias, with unifoliolate leaves, is found in Panama. Two other taxa described from Guatemala and Nicaragua are thought to belong to *Angostura* Romer & Schultes (Elias, 1970). A fourth species from Central America is herein described as new.

Galipea dasysperma Gómez-Laurito & Q. Jiménez, sp. nov. TYPE: Costa Rica. Puntarenas: Península de Osa, Sierpe, camino entre Rancho Quemado y Sierpe, 8°44′10″N, 83°35′30″W, 100 m, 21 jun. 1990, *G. Herrera 4228* (holotype, CR; isotypes, F, K, MO, NY, USJ). Figure 1.

Galipeae trifoliatae Aublet atque *G. jasminiflorae* Engler habitu, foliis trifoliolatis etiam inflorescentia corymbosa similis et sine dubio his speciebus proxima; ab eis praecipue corolla longiore marginibus undulatis lobulorum munita, carpellis biseminalibus, seminibus cuneiformibus omnino pubescentibus differt.

Shrub or small tree to 6 m high and 12 cm DBH. Leaves alternate, 3-foliolate; leaflets entire, glabrous, the venation raised on the upper surface, glandular-dotted, the margins undulate. Terminal leaflet lanceolate, 11–15 cm long, 3.5–4.5 cm wide, acuminate at the tip, basally short-decurrent, with ca. 10 secondary nerves per side. Lateral leaflets lanceolate to ovate, 6–10 cm long, 2–3 cm wide, acuminate at the tip, unequal at the base. Petioles 3.4–5 cm long, semi-terete, canaliculate adaxially, very narrowly winged, glabrous, glandular-dotted with tiny resinous glands. Petiolules 3–10 mm long, glabrous. Inflorescence lateral, corymbose, 4–5 cm long, 2.5–3.5 cm wide, with 4–8 flowers; peduncles terete, 5–11 cm long, 1 mm diam., the branches 1–2.5 cm long; pedicels 2–5 mm long in flower, glabrous or with few scattered hairs. Calyx campanulate, 4–5 mm long, glandular-dotted, lobes 5, ca. 1 mm long, carinate, tube 2–3 mm long. Corolla 2–2.5 cm long, densely sericeous and glandular-dotted without, white to cream color, hirsute within, fragrant, with 5 oblong-ovate lobes 1–1.9 cm long, the margins undulate, acute at the apex; tube 1–1.2 cm long, narrowed toward the base, straight or slightly curved. Fertile stamens 2, attached near the middle of the tube, filaments ca. 1 cm long; anthers slightly exserted at maturity, oblong, 6 mm long, 1.8 mm wide, acute at the apex, basal appendages minute, flaplike, about 1 mm long; staminodes 5–6 with pilose filaments, terete, 3–4 mm long, inserted near apex of tube, each with a spherical apical gland. Pollen spheric, granulate, 6.5 μm diam. Disc cupular, enclosing the ovary. Ovary of 5 free carpels, glabrous, 1 mm long, each with 2 superposed ovules. Style 13 mm long, glabrous; stigma capitate. Fruits of 5 mericarps, subglobose, 1.5 cm long, 1.2 cm broad, each axially carinate, dehiscent from the apex to near the middle, glandular-punctate, green when fresh, greenish brown when dry. Seeds 2 per mericarp, cuneate, 5 mm long, 3.5 mm wide, dark brown, pusticulate and pilose with brownish yellow trichomes.

Etymology. The epithet refers to the plant's remarkable pubescent seeds.

Galipea dasysperma is widely distributed in Costa Rica and Nicaragua in wet and moist forest, on both the Caribbean and Pacific slopes, from 100 to 450 m elevation. It is found in primary and secondary forest associated with *Amyris pinnata* Kunth

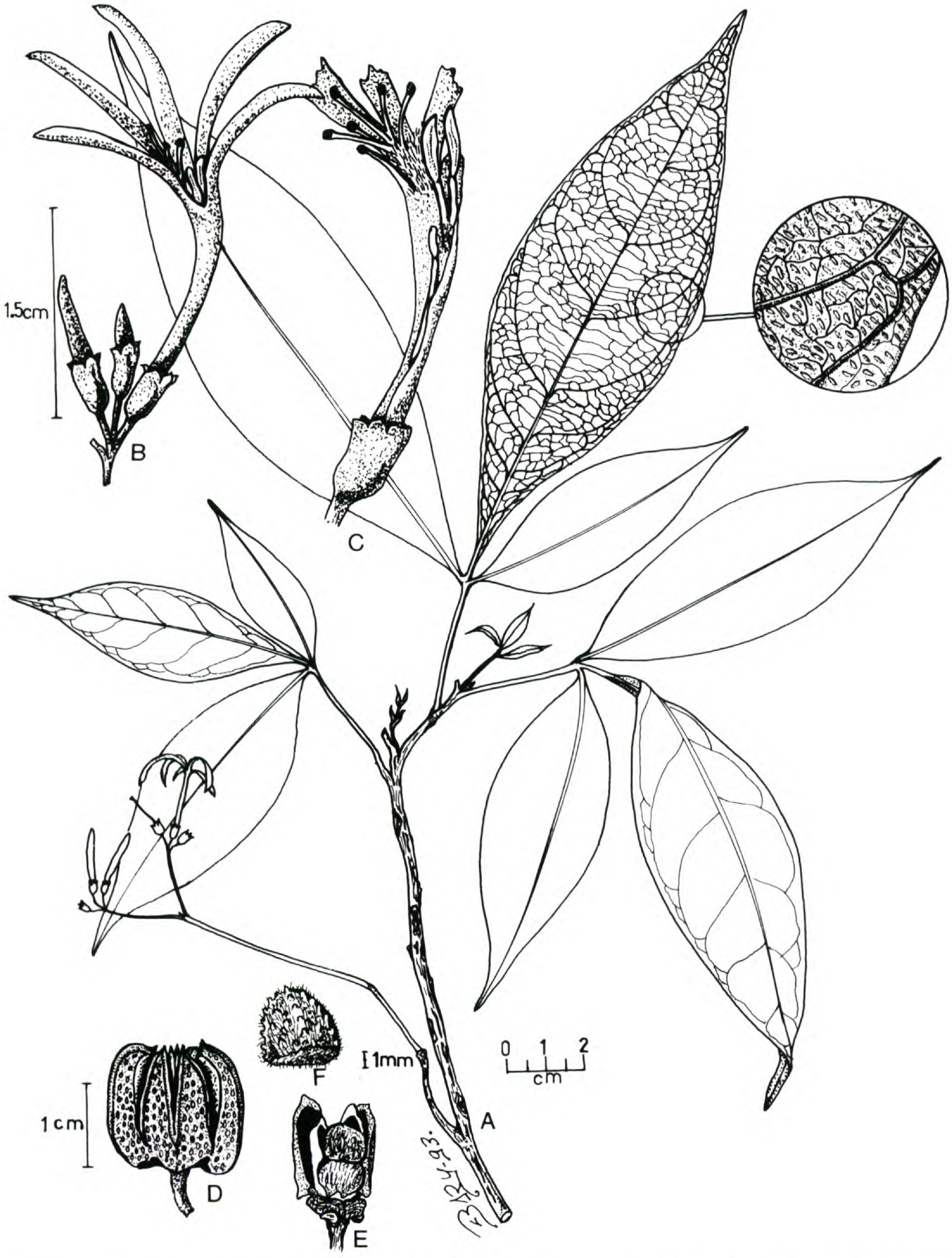

Figure 1. *Galipea dasysperma* Gómez-Laurito & Q. Jiménez (*Herrera 4228*, CR). —A. Habit. —B. Flower and buds. —C. Dissected flower. —D. Fruit. —E. Open mericarp showing seeds. —F. Seed.

and *Ravenia rosea* Standley (Rutaceae), *Otoba novogranatensis* Moldenke (Myristicaceae), *Pithecellobium confusum* (A. Rico) N. Zamora (Fabaceae–Mimosoideae), *Ocotea atirrensis* Mez & J. D. Smith (Lauraceae), and *Acidoton nicaraguensis* (Hemsley) Webster (Euphorbiaceae), among others. *Galipea dasysperma* is closely related to *G. trifoliata* Aublet from Panama and South America, and *G. jasminiflora* Engler from South America; the three have similar habits, trifoliolate leaves, and corymbose inflorescences. *Galipea dasysperma*, however, has longer corollas 2 to 2.5 cm long, 2-seeded carpels, and cuneiform seeds covered with brownish yellow hairs.

Paratypes. COSTA RICA. **Alajuela:** San Ramón, Bajo Rodriguez, 8 Feb. 1976, *J. Utley 4095* (MO); Upala, Dos Ríos, Finca La Selva, 10°56′N, 85°19′W, 3 Apr. 1988, *G. Herrera 1681* (CR, F, MO, NY, USJ); Monteverde, Bosque Eterno de los Niños, *Haber 11244* (MO, CR). **Guanacaste:** La Cruz, Santa Cecilia, Finca La Pasmompa, 11°02′00″N, 85°25′20″W, 11 Sep. 1990, *Cháves 64* (CR, MO), 26 May 1989, *R. Robles et al. 2832* (CR, MO), 17 June 1989, *Kallunki 306* (CR, MO, NY). **Limón:** Talamanca, Suretka, La Pera, 9°35′20″N, 82°53′50″W, 18 July 1982, *J. Gómez-Laurito 8800* (CR), 24 May 1982, *J. Gómez-Laurito 8835* (CR), 25 May 1982, *K. Barringer et al. 2680* (F, MO), 7 Dec. 1991, *J. Gómez-Laurito et al. 12124* (CR, F, MO, USJ). **San José:** Puriscal, Zona Protectora La Cangreja, 9°42′N, 84°20′W, 4 Dec. 1986, *N. Zamora & Q. Jiménez 1315* (CR, MO), 22 jul. 1988, *B. Hammel et al. 17125* (MO, NY). NICARAGUA. **Depto. Río San Juan:** Río Sábalos, 2 km al W de Santa Eduviges, 11°03′N, 84°29′W, elev. ca. 80 m, 18 feb. 1984, *Pedro P. Moreno 23068* (HNMN); Buenos Aires, 1 km al Norte del caserío de Sábalo, sobre el Río Sábalo, 11°02′N, 84°28′W, elev. 70 m, 10 sep. 1985, *Pedro P. Moreno 26300* (MO). **Depto. Zelaya:** Cano Costa Riquita, ca. 1.8 km SW of Colonia Naciones Unidas, above (S of) road between Colonia Nueva León and Colonia Naciones Unidas, ca. 11°43′N, 84°18′W, elev. 150–180 m, *W. D. Stevens 5024* (MO).

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Literature Cited

Elias, T. S. 1970. Notes on the genus *Galipea* (Rutaceae) in Central America. J. Arnold Arbor. 51: 427–430.

Mabberley, D. J. 1987. The Plant-book. Cambridge Univ. Press, London.

Porter, D. M. & T. S. Elias. 1979. Rutaceae. *In:* Flora of Panama. Ann. Missouri Bot. Gard. 66: 139–142.

New Species in the Acanthaceae of Costa Rica

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ABSTRACT. As a result of the current general inventory of the flora of Costa Rica, six new species of Acanthaceae are described. Three, *Justicia aurantiimutata*, *J. deaurata*, and *J. peninsularis*, are known only from the Osa Peninsula, or nearby. The other three, *Habracanthus tilaranensis*, *Kalbreyeriella rioquebradasiana*, and *Razisea villosa*, are more widespread but still known only from Costa Rica.

Collections from relatively well known regions of the tropics, even of easily collected habit types, continue to reveal novelties. In spite of the recency of floristic treatments for the Acanthaceae of Costa Rica and Panama (Durkee, 1978, 1986), numerous additions have since come to light for the region (cf. Daniel, 1993; Daniel & Wasshausen, 1990; Gómez-Laurito, 1990; Gómez-Laurito & Grayum, 1991). Three of the six Costa Rican species described below are red-flowered, road or trailside subshrubs of well-traveled areas. The other three are from the long-isolated and little-explored Osa Peninsula and have lavender, yellow, or green flowers.

Habracanthus tilaranensis Gómez-Laurito, sp. nov. TYPE: Costa Rica. Puntarenas: Esparza, Peñas Blancas Refugio de Vida Silvestre, 10°07′50″N, 84°40′25″W, 1,000–1,400 m, 30 Nov. 1986 (fl, fr), *G. Herrera et al. 292* (holotype, CR; isotype, MO). Figure 1.

Species combinatione foliorum lanceolatorum, inflorescentiarum paniculatarum, 25 cm × 8 cm, corollarum bilabiatarum, flavarum apice rubro, fructuum pilosorum a congeribus distinguenda.

Suffruticose shrubs 1–4 m tall, internodes 2–2.5 cm long, sparsely pubescent. Petioles 3–8 cm long, glabrous. Lamina lanceolate, 13–17 cm long, 5–7.3 cm wide, acuminate at the tip, long attenuate at base, glabrous on both surfaces with ca. 10 pairs of arcuate secondary nerves, margin entire. Inflorescence paniculate, terminal, many-flowered, ca. 25 cm long and 8 cm wide. Peduncles of the panicle about 10 cm long, quadrangular, short pilose. Branches to 3 cm long, flattened, short puberulous with intermixed glandular and non-glandular trichomes. Secondary branches to 1 cm long. Tertiary branches to 5 mm long. Pedicels 2–3.5 mm long, hirsute with intermixed glandular and non-glandular trichomes. Bracts 1.5–2.5 cm long, ovate, short acuminate at tip, almost sessile. Bracteoles minute, subulate, ca. 1 mm long. Calyx 5-merous, segments lanceolate, 3–5.5 mm long, short puberulous with scattered glandular trichomes, undivided portion 0.5 mm long, swollen. Corolla bilabiate, arched in bud, straight in anthesis, 11 mm long, 2.5 mm wide, yellow with red tip, sparsely pubescent (eglandular), expanded just above the tube; tube 4 mm long, 1.3 mm wide; throat 2.5 mm diam.; upper lip 1.5 mm long, straight, acute; lower lip 3-lobulate, lobules ca. 1 mm long, acute. Stamens 2, exserted to 6 mm longer than the corolla; filaments flattened, glabrous; anthers dorsifixed, longitudinally dehiscent, locule 2 mm long; pollen spheroidal, ca. 40 μm diam. (Fig. 7A). Ovary glabrous, attached on a basal disc; disc 0.8 mm long, 0.6 mm wide, glabrous. Style exserted to 6 mm longer than the corolla, glabrous; stigma simple, capitate. Fruits claviform, 1 cm long, pilose (eglandular), acute at the tip; retinacula acute. Seeds elliptic, 2 mm long, 1.2 mm wide, truncate at the base, pale yellow, papillose throughout.

Habitat and distribution. Known only from moist forest at mid elevations on the Pacific slope of the Cordillera de Tilarán.

Paratypes. COSTA RICA. **Guanacaste:** Abangares, El Dos, 10°22′N, 84°54′W, 900 m, 19 Oct. 1986 (fl), *Haber & Bello 5996* (CR, MO).

Justicia aurantiimutata Hammel & Gómez-Laurito, sp. nov. TYPE: Costa Rica. Puntarenas: Reserva Forestal Golfo Dulce, Cantón de Osa, camino nuevo entre Rancho Quemado y Drake, 08°43′N, 83°36′W, 100–350 m, 7 Feb. 1991 (fl, fr), *Hammel et al. 18074* (holotype, CR; isotypes, ARIZ, CAS, INB, MO). Figure 2.

Figure 1. *Habracanthus tilaranensis* Gómez-Laurito (*Herrera et al. 292*).

Ab affini *J. readii* Panamae pariter versicolori in siccitate (sed illa rubescens) differt statura minore, inflorescentiis longioribus et laxioribus, bracteis et floribus minoribus. Tincto aurantio prodit a speciebus nobis notis distincta.

Herbs to 40 cm tall; stems terete; internodes 4–5 cm long. Stems, internodes, nodes, petioles, and young parts hirsute, the trichomes turning orange to rusty brown upon drying. Petioles 10–15 mm long, hirsute. Lamina elliptic, 4–11 cm long, 2–3.5 cm wide, pilose to hirsute on both surfaces, with ca. 10 pairs of secondary veins, acute at the tip, basally cuneate, margin entire, undulate, ciliate. Inflorescences spicate, 5–11 cm long, axillary and terminal, many-flowered, dense, becoming lax in fruit; flowers alternate. Peduncle 2–4 cm long, 0.1 mm wide, terete, glandular-pilose. Rachis flattened, ca. 1 mm wide, pubescent with eglandular and glandular trichomes. Bracts obovate, 4.5–7.5 mm long, 3.5–4.5 mm wide, acute to rounded at apex, basally cuneate, hirsute with intermixed gland-tipped and non-glandular trichomes. Bracteoles lanceolate, 3–4 mm long, acute at the tip, otherwise similar to bracts. Calyx 5-merous, segments of equal length, subulate, pilose with intermixed glandular and non-glandular trichomes. Corolla bilabiate, 10–13 mm long, white to lavender with purple lines, glabrous; tube 4 mm long, 2 mm wide; throat 2 mm diam.; upper lip 4 mm long, 1.5 mm wide, straight; lower lip broadened, 6 mm long, 6.5 mm wide. Stamens 2, slightly exserted, but not exceeding the upper lip; filaments flattened, glabrous; anthers two-locular, dorsifixed, longitudinally dehiscent, locules superposed, separated by a connective, lower locule drawn out into a hyaline spur; pollen prolate, ca. 34 × 24 μm (Fig. 7B). Ovary glabrous; style slightly exserted; stigma simple, capitate. Fruits clavate, 1 cm long, short pilose, acute at the tip; retinacula acute. Seeds 4, broad-elliptic, 1.5 mm long, 2 mm wide, basally slightly cordate, rusty, aculeate throughout.

Habitat and distribution. This species is known only from two localities, at the edge of primary forest, on the Osa Peninsula. Recent collections from the type locality have brought to light a number of disjunctions with northern Amazonia such as *Anaxagorea dolichocarpa* Sprague & Sandwith (Annonaceae) and *Ichnanthus panicoides* Beauvois (Poaceae). Because the Osa Peninsula, in general, is unusually rich in apparent disjuncts from South America (e.g., *Pterygota excelsa* (Standley & L. O. Williams) Kostermans (Sterculiaceae), *Williamodendron*, *Caryodaphnopsis* (Lauraceae)), there is reason to suspect that the nearest relatives of this new species may lie to the south rather than with its Mesoamerican congeners from which it differs markedly.

Etymology and relationships. The epithet refers to the remarkable change this species, especially its pubescence, undergoes from more or less colorless to bright orange or rusty-colored upon drying. It must be noted, however, that this change appears in conjunction with material conserved in alcohol in the field and later dried. Freshly dried material retains its subdued hues but shows its colors in water, which it darkly and rapidly tints orange—rather than blue as in the manner of *J. tinctoria* (Oersted) D. N. Gibson.

Among the Costa Rican species *J. aurantiimutata* is most similar to *J. refractifolia* (Kuntze) Leonard, which differs most obviously by its pubescent filaments and lack of glandular trichomes. However, *J. readii* T. F. Daniel & Wasshausen from Panama matches *J. aurantiimutata* in those (and other) characters. From that species it differs in smaller stature, longer, more lax inflorescences, smaller bracts, and smaller flowers. Furthermore, the color change in *J. readii* is to red, involves only the bracts, and apparently happens irrespective of how the plants were treated before drying. The pollen also differs markedly from that of *J. readii;* it is quadrilaterally instead of trilaterally symmetric and the two rows in the trema region are not divided into insulae. Neither *J. refractifolia* nor *J. readii* appears to produce an orange dye. In life, *J. aurantiimutata* is a rare and rather small, nondescript, forest herb with pale lavender flowers.

Paratypes. COSTA RICA. **Puntarenas:** Reserva Forestal Golfo Dulce, Cantón de Osa, camino nuevo entre Rancho Quemado y Drake, 08°43′N, 83°36′W, 100–350 m, 11 Apr. 1992 (fr), *Hammel et al. 18485* (F, INB, MO, US), 7 Feb. 1991 (fr), *Maas et al. 7879* (CR, U); Alto los Mogos, 08°45′N, 83°22′20″W, 20 m, 9 Jan. 1991 (fl), *E. Castro 19* (CR, MO, USJ); Parque Nacional Corcovado, Cerro Brujo, orilla de la Quebrada Vaquedano, 8°38′N, 83°35′W, 400 m, 22 Jan. 1991 (fl), *Cordero 140* (CR).

Justicia deaurata Hammel & Gómez-Laurito, sp. nov. TYPE: Costa Rica. Puntarenas: Reserva Forestal Golfo Dulce, Cantón de Osa, Fila al N del antiguo campo de aterrizaje, Estación Agua Buena de Boscosa, 8°42′40″N, 83°31′W, 50–150 m, 7 Nov. 1991 (fl), *Aguilar & Hammel 609* (holotype, CR; isotypes, ARIZ, CAS, INB, MO, US). Figure 3.

A *J. aurea* inflorescentiis ferrugineo-tomentosis, 1–3 spicatis, bracteis bracteolisque minoribus, calycis lobis latioribus, corollis majoribus recedit.

Shrubs to 2.5 m tall; branches quadrangular, conspicuously ferrugineous-tomentose on younger

Figure 2. *Justicia aurantiimutata* Hammel & Gómez-Laurito (*Hammel et al. 18074*). —A. Habit. —B. Corolla. —C. Anther. —D. Bract. —E. Bracteoles, calyx, and capsule.

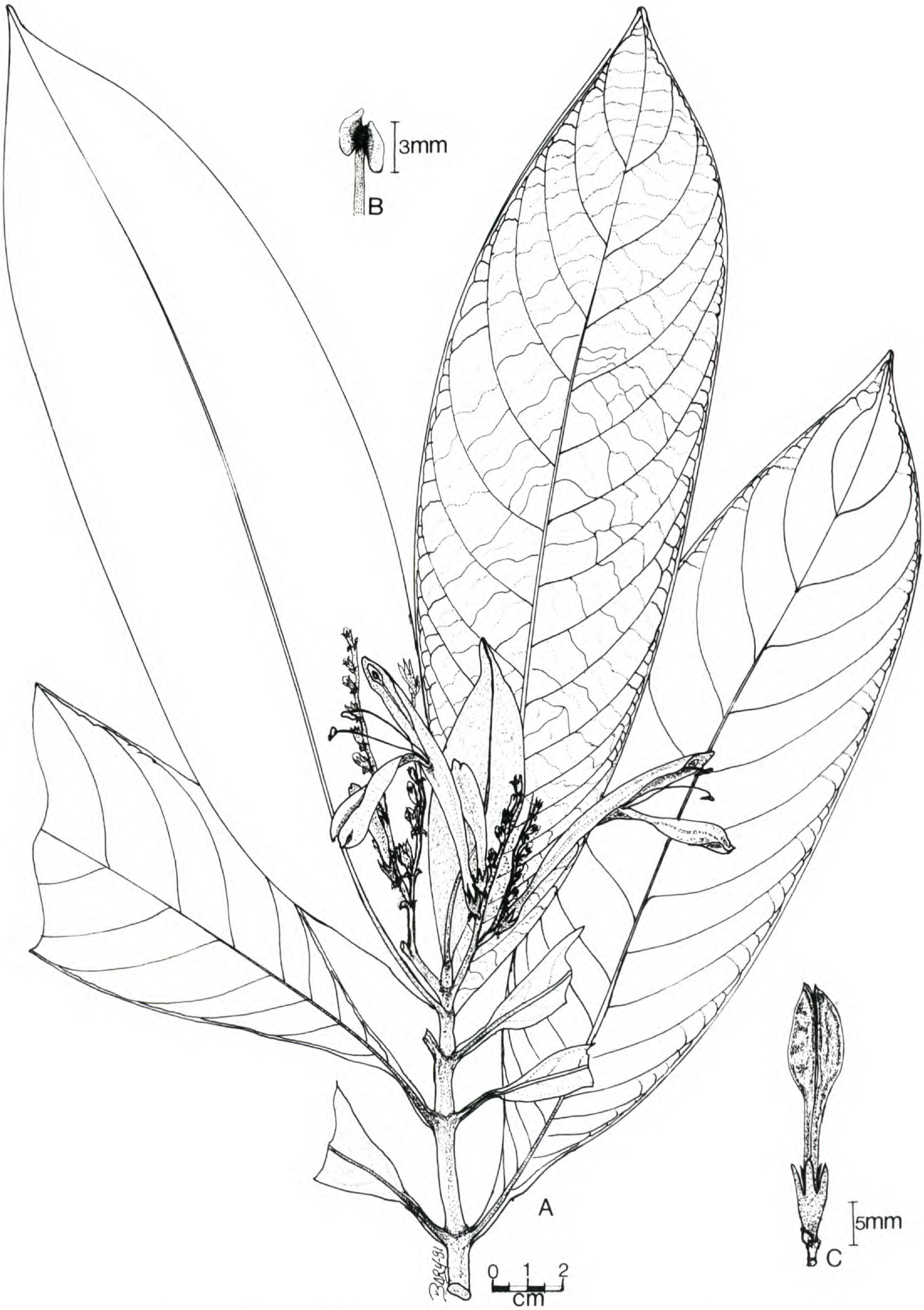


Figure 3. *Justicia deaurata* Hammel & Gómez-Laurito (*Aguilar & Hammel 609*). —A. Habit. —B. Anther. —C. Capsule subtended by minute bracteoles and bracts.

branchlets; internodes 1.5 cm long. Petioles 0.5–1 cm long, ferrugineous-tomentose. Lamina elliptic, 23–34 cm long, 4.5–9 cm wide, with ca. 11–15 pairs of secondary veins, acuminate at the tip, basally cuneate, margin entire, undulate, the midrib basally ferrugineous, tomentose beneath. Inflorescences grouped at branch tips, the axes with 1–3 spikes of secund flowers on a common peduncle ca. 1 cm long. Each rachis ca. 2–7 cm long, 2 mm wide, quadrangular, ferrugineous-tomentose. Bracts minute, 1–1.5 mm long, subulate, basally ferrugineous-tomentose. Bracteoles bractlike. Calyx 5-merous, 8–10 mm long, segments of equal length, subulate, 4.5–5 mm long, tomentose inside, undivided portion 4–5 mm long, 1.5–2 mm wide at base. Corolla bilabiate, 5.5–7 cm long, bright golden yellow, sparsely pubescent externally with minute gland-tipped trichomes; tube 3.5–4.5 cm long; throat 5 mm diam.; upper lip straight, 2.5 cm long; lower lip broadened, 2.5 cm long, 3-lobulate, lobules ca. 4.5 mm long. Stamens 2, slightly exserted, but not exceeding the upper lip; anthers with unequal cells, bigger cell 3 mm long, smaller cell 2 mm long; pollen prolate, ca. 73 × 37 μm (Fig. 7C). Ovary pubescent, attached into a basal disc; style slender; stigma simple capitate. Fruits claviform, glabrous, 30 mm long, 8 mm wide, acute; retinacula acute. Seeds orbicular, flat, papillose, yellow.

Habitat and distribution. This species is known only from a single population in tall, primary, hillside forest near Rincón de Osa. The area is also home to the endemic Rubiaceae *Osa pulchra* (D. R. Simpson) Aiello, as well as one of two sites on the peninsula with *Recchia simplicifolia* T. Wendt & E. J. Lott, an unusual species of Simaroubaceae disjunct (from southern Mexico).

Etymology and relationships. The epithet is derived from the combination of the prefix "de," which in many Latin words imparts an emphatic or repetitive nuance as in "declare—to make clear" or "decantare—to sing or say repeatedly," with "auratus—golden," in reference to the very bright, golden yellow corollas of this species. *Justicia deaurata* differs from the other large, yellow-flowered Costa Rican *Justicia* (*J. aurea* Schlechtendal) by its smaller, spicate-secund inflorescences, much smaller bracts and bracteoles, shorter and broader calyx lobes, somewhat larger corollas, ferrugineous pubescence, shinier, darker green leaves, and primary rather than secondary forest habitat. In view of its spicate-secund inflorescences, *J. deaurata* would key to the vicinity of *J. spicigera* Schlechter and *J. tinctoria* in Durkee (1986). It differs markedly from both of those species by its much larger, bright yellow flowers, anthers with unequal cells, its ferrugineous pubescence, and in that it does not produce a blue dye. More than any of the other *Justicia* species described here *J. deaurata* seems to lack close relatives among its southern Central American congeners. It can be recognized by its large yellow flowers and the brownish tomentose inflorescence rachis. The species would make a handsome ornamental but does not fare well in open, garden habitat.

Paratypes. COSTA RICA. **Puntarenas:** Reserva Forestal Golfo Dulce, Cantón de Osa, Fila al N del antiguo campo de aterrizaje, Estación Agua Buena de Boscosa, 08°42′40″N, 83°31′W, 100–500 m, 28 nov. 1990 (fl), *Hammel 17981* (CR, MO), 22 nov. 1991 (fl, fr), *Aguilar 690* (CR, F, INB, MO).

Justicia peninsularis Gómez-Laurito & Hammel, sp. nov. TYPE: Costa Rica. Puntarenas: Cantón de Osa, Aguabuena de Rincón, 8°42′40″N, 83°31′40″W, 400 m, 25 Oct. 1990 (fl, fr), *G. Herrera 4505* (holotype, CR; isotypes, ARIZ, INB, MO, US). Figure 4.

Ab affini *J. orosiensis* differt bracteis et floribus multo majoribus; statura, foliis et inflorescentiis grandibus ab aliis speciebus regionis distincta.

Suffruticose herbs to 1.5 m tall. Stems quadrangular. Internodes 9.5–10 cm long, 3.5–4 mm wide, pale green. Petioles 3–6.5 cm long, ± quadrangular, sparsely pilose, canaliculate above. Lamina broadly elliptic, 10–33 cm long, 10–13.5 cm wide, with ca. 10 pairs of secondary veins, the other veins conspicuously reticulate, acuminate at the tip, basally truncate, margins entire. Inflorescence thyrsiform, terminal, many-flowered, 13–20 cm long, 3 cm wide, branches opposite but flowers alternate. Pedicels 12–20 mm long, quadrangular, pilose. Bracts 1–1.6 cm long, 0.5–0.8 cm wide, acute at apex, ciliate at margins, conspicuously veined and punctate. Bracteoles 1–1.5 cm long, 1–1.3 mm wide, punctate, margins ciliate, conspicuously veined. Calyx 5-merous, segments of equal length, subulate, 7.5 mm long, punctate, margins and midrib ciliate. Corolla bilabiate, 2.8 cm long, green, externally pilose; tube 1.9 cm long, white; throat 5 mm diam.; upper lip straight, 8 mm long, minutely bidentate; lower lip 7 mm long, downward curved, pale green with longitudinal reddish purple lines, 3-lobulate, lobules 1.5–2 mm long. Stamens 2, slightly exserted but not exceeding the upper lip; filaments slender; anthers with superposed locules; locules 2.5 mm long, longitudinally dehiscent; pollen prolate, ca. 47 × 26 μm (Fig. 7D). Ovary glabrous; style slender; stigma single, capitate. Fruits claviform, 9–10 mm long, glabrous, cuspidate at the tip; retinacula acute

Figure 4. *Justicia peninsularis* Gómez-Laurito & Hammel (*Hammel et al. 18019*). —A. Habit. —B. Corolla. —C. Anther. —D. Bract. —E. Bracteoles and calyx. —F. Capsule.

or rounded. Seeds 2, ± orbicular, ca. 2 mm diam., bright brown to black.

Habitat and distribution. This species is found throughout the wettest parts of the Osa Peninsula where it is locally common, especially at the edge of primary forest on slopes.

Etymology and relationships. Justicia peninsularis derives its epithet from having been first encountered on the Osa Peninsula. This species appears to be closely related to *J. orosiensis* Durkee, from which it differs mainly by its much larger flowers and bracts but also by its generally large stature, leaves, and inflorescence, distinguishing it,

as well, among other *Justicia* spp. of the region. Another apparently undescribed species of the wet Caribbean lowlands (e.g., *Grayum et al. 7937*, *Robles 1524*, and *Stevens et al. 24932*) bears considerable resemblance to *J. peninsularis* but differs, among other details, in having pubescent, somewhat smaller leaves that are basally cuneate, pubescent pedicels, and white rather than green corollas.

Paratypes. COSTA RICA. **Puntarenas:** Refugio Nacional de Vida Silvestre Golfito, 8°40′30″N, 83°12′W, 160–240 m, 11 Dec. 1988 (fl), *Grayum & Herrera 9203* (CR); Cantón de Osa, Aguabuena, Fila Casa Loma, siguiendo el antiguo camino a Rancho Quemado, 8°43′N, 83°32′W, 500 m, 2 Oct. 1990 (fl), *G. Herrera 4431* (CR, INB); Cantón de Osa, Fila Ganado al noroeste de Rancho Quemado, 8°44′N, 83°36′50″W, 350 m, 15 Dec. 1990 (fl, fr), *Hammel et al. 18019* (ARIZ, CR, F, MO, US); Cantón de Osa, entre Rancho Quemado y Drake, 8°43′N, 83°36′W, 300 m, 7 Feb. 1991 (fl, fr), *Hammel et al. 18080* (CR, INB, MO); Parque Nacional Corcovado, 08°38′N, 83°35′W, 600 m, 23 Jan. 1991 (fl), *E. Castro 232* (CR, MO).

Kalbreyeriella rioquebradasiana Gómez-Laurito & Hammel, sp. nov. TYPE: Costa Rica. San José: Cantón de Pérez Zeledón, Cerro de la Muerte, carretera interamericana km 115–116, 09°28′40″N, 83°41′25″W, 1,750 m, 4 Feb. 1991 (fl, fr), *Hammel et al. 18053* (holotype, CR; isotypes, ARIZ, CAS, F, INB, MO, US, USJ). Figure 5.

Ab affini *K. rostellata* differt foliis et floribus multo menoribus.

Subshrubs to 60 cm tall. Stems and branchlets slender, with appressed trichomes. Petioles 8–11 mm long, terete, appressed-pilose canaliculate above. Lamina elliptic, 7–12 cm long, with ca. 11 pairs of secondary veins, acuminate at apex, basally attenuate, secondary veins minutely appressed-pilose beneath, margins entire, undulate. Inflorescence racemose, slender, axillary and terminal, many-flowered, 6–12 cm long, 1.5–2 cm wide; rachis with minute appressed trichomes. Bracts ovate, 2.5 mm long, glabrous, acute at the tip. Bracteoles 1.5 mm long, subulate, glabrous. Pedicels 1–4(–6) mm long. Calyx 5-merous, segments of equal length, lanceolate, 4–4.5 mm long, green, glabrous. Corolla bilabiate, ventricose in bud, arched and abruptly inflated above the calyx in anthesis, red with yellow tip, 2.8–3 cm long; throat 3.5 mm diam.; upper lip 3 mm long, straight, minutely bidentate at the tip; lower lip minute, 3-lobulate. Stamens 2, exserted to 2 cm longer than the corolla; filaments flattened, reddish; anthers 1-locular, 2 mm long, basifixed, longitudinally dehiscent; pollen spheroidal, ca. 58 μm diam. (Fig. 7E). Ovary glabrous; style exserted to 2 cm longer than the corolla, reddish; stigma single, capitate. Fruits claviform, 12–13 mm long, glabrous, acute at the tip. Seeds elliptic, 3 mm long, 2 mm wide, dark brown.

Habitat and distribution. In wet forest at middle elevations (ca. 1,700 m) on the southern slope of Cerro de la Muerte, known only from along the Interamerican Highway just north of San Isidro del General. The species is common here but apparently restricted to a relatively narrow zone.

Etymology and relationships. The epithet refers to the Río Quebradas stream, which passes by the type locality. This species is unusual among Costa Rican Acanthaceae for having bright red, yellow-tipped corollas in a racemose inflorescence. It differs from the Panamanian and Colombian *K. rostellata* Lindau primarily by virtue of its much smaller leaves and flowers. In spite of the stated differences (Durkee, 1978) between *Kalbreyeriella* and *Razisea* (in *Kalbreyeriella* the corolla is beaked and gibbous in bud, and the bracts are 2–3 times shorter than the calyx lobes), individuals of the common *R. spicata* Oersted often have beaked and somewhat gibbous corollas and bracts that vary from shorter to longer than the calyx lobes. Resemblance of pollen of *K. rioquebradasiana* and the species of *Razisea* described below further suggests that a critical study of the supposed differences between these two genera is in order (see McDade, 1982). Unfortunately, the problem involves at least one or two other genera (McDade, pers. comm.) and will not be resolved here. Given that the bracts are about half the length of the calyx lobes in both species, the rationale for describing the present one in *Kalbreyeriella* and the following in *Razisea* is that this species has a much more abruptly inflated corolla.

Paratypes. COSTA RICA. **San José:** Cantón de Pérez Zeledón, Cerro de la Muerte, Carretera Interamericana Km 117, 09°28′40″N, 83°41′25″W, 1,700 m, 8 Nov. 1990 (fl), *Hammel & M. M. Chavarría 17957* (CR, MO), 27 Nov. 1990 (fl), *Hammel 17975* (CR, MO).

Razisea villosa Gómez-Laurito & Hammel, sp. nov. TYPE: Costa Rica. Puntarenas: Golfito, Jiménez, Dos Brazos de Río Tigre, margen izquierda de Quebrada Brasileña, Fila Puriscal Rico, subiendo a Cerro Müller, 8°30′55″N, 83°28′15″W, 700 m, 24 Nov. 1990 (fl, fr), *G. Herrera & C. Fallas 4641* (holotype, CR; isotypes, ARIZ, CAS, F, MO, US). Figure 6.

Species statura minori, caulibus conspicue villosis, floribus minoribus a congeribus distinguenda.

Herb 25–70 cm tall. Stems quadrangular, villose with curled, multicellular 1–2-mm-long trichomes.

Figure 5. *Kalbreyeriella rioquebradasiana* Gómez-Laurito & Hammel (*Hammel 17957*). —A. Habit. —B. Flower. —C. Bract, bracteoles, and calyx.

Internodes 3–7 cm long. Petioles 1–3 mm long, villose. Lamina elliptic, 15–20 cm long, 5–8.5 cm wide with ca. 11 pairs of secondary veins, acuminate at the tip, basally attenuate, margins undulate, villose on both surfaces. Inflorescence racemose, terminal, 11–24 cm long, ca. 3 mm wide, many-flowered; rachis villose. Pedicels ca. 3 mm long. Bracts ca. 5 mm long, subulate, glabrous. Bracteoles similar to bracts. Calyx 5-merous, segments of equal length, subulate, 8 mm long, glabrous. Corolla bilabiate, ascending, arched, 3.3 cm long, red, glabrous; throat 3 mm diam.; upper lip ca. 5 mm long, straight,

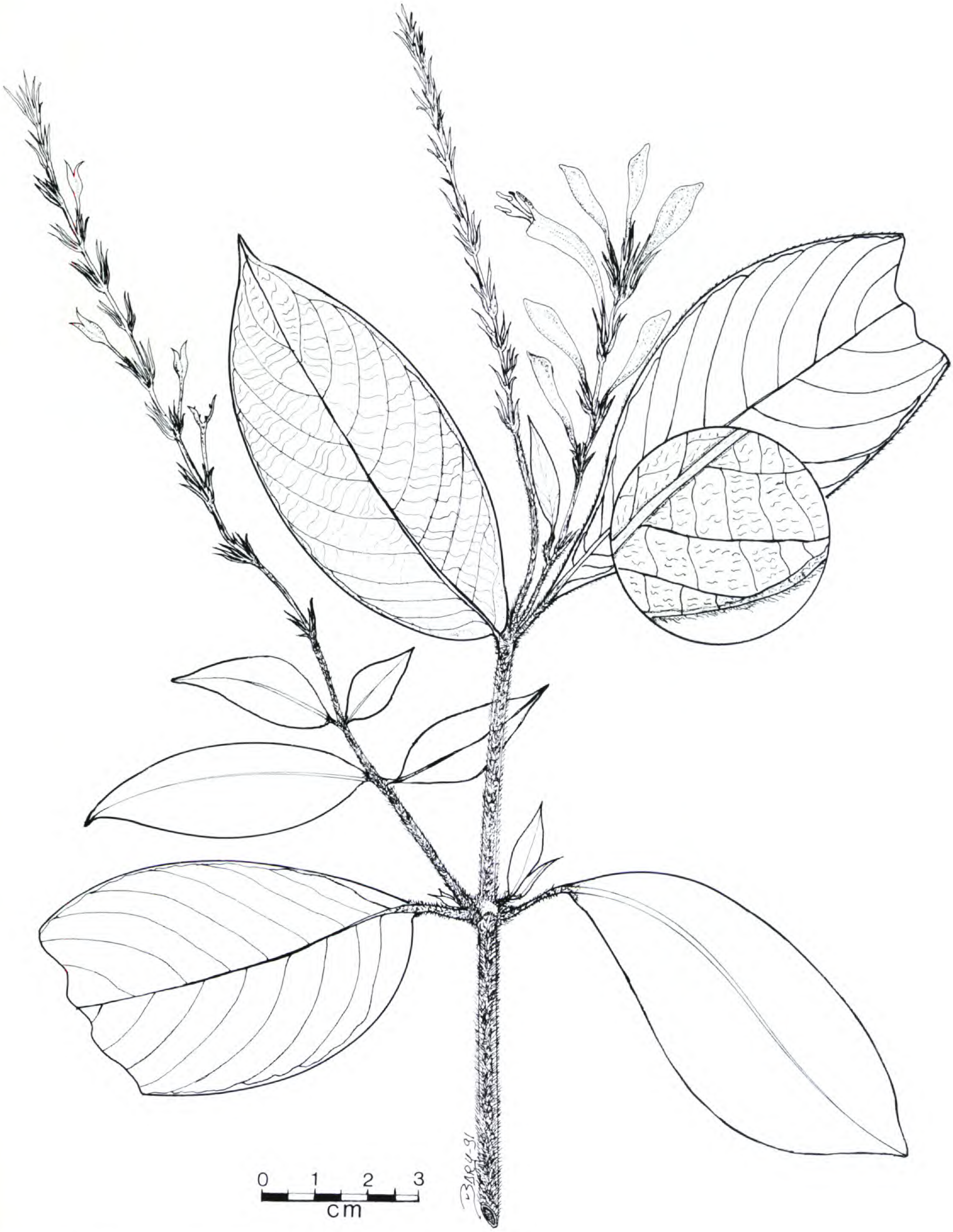
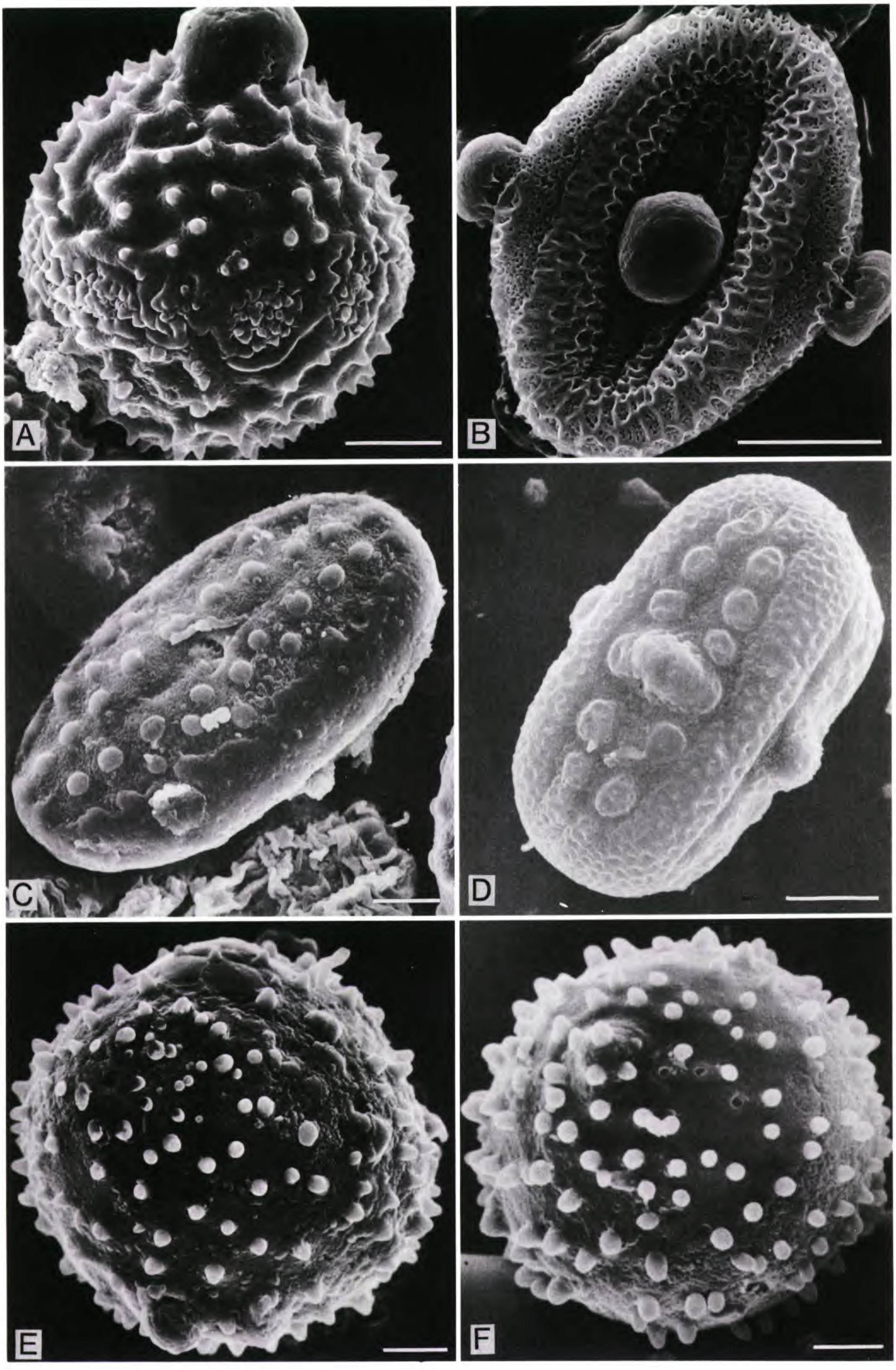


Figure 6. *Razisea villosa* Gómez-Laurito & Hammel (*Herrera & Fallas 4641*).

acute; lower lip 3-lobulate, lobules ca. 1 mm long, acute. Stamens 2, exserted to 8 mm longer than the corolla; filaments flattened, glabrous; anthers 1-locular, dorsifixed, longitudinally dehiscent, locule 3.5 mm long; pollen spheroidal, ca. 57 μm diam. (Fig. 7F). Ovary glabrous; style exserted to 8 mm longer than the corolla, glabrous; stigma single, capitate. Fruits claviform, 1.8 cm long, glabrous, acute


A
B
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F

at the tip; retinacula acute. Seeds ± deltoid, 2.2 mm long, 1.8 mm wide, pale yellow, papillose throughout.

Habitat and distribution. Known from wet lowlands of the Atlantic slope and from the Osa Peninsula on the Pacific; in shade along streams or edge of swamp forest.

Etymology and relationships. For Costa Rica, and the genus, this is the fourth species of *Razisea*. Among the three red-flowered species, *R. villosa* is easier to distinguish, in general appearance, from *R. spicata* than is the smaller-flowered twin of that species, *R. wilburii* McDade. Besides its relatively small corollas, *R. villosa* differs in its conspicuous red, villous pubescence (from whence the epithet), and its much smaller stature. In addition, it differs from *R. wilburii* by its longer (ca. 2×) calyx lobes, more like those of *R. spicata*. Our understanding of the three red-flowered species of *Razisea* at one site (La Selva Biological Station) indicates that the new species is relatively rare and found in somewhat wetter (swampy) and less secondary habitats than the other two species.

Paratypes. COSTA RICA. **Heredia:** Sarapiquí, N of Puerto Viejo, 12 km to ferry, over ferry, 6 km along road, 100 m, 3 Feb. 1983 (fl), *N. Garwood et al. 1013* (CR); La Selva, 3 km SE of Puerto Viejo, 45 m, 9 Dec. 1972 (fl), *P. Opler 1619* (CR); Sarapiquí, Rara Avis, ca. 15 km SO de Horquetas, camino Leví, 10°17′N, 84°02′W, 400 m, 9 Oct. 1989 (fl, fr), *O. Vargas 212* (ARIZ, CR, INB, MO); El Plástico, 600 m, 30 Oct. 1992 (fl, fr), *I. Chacón 92-36* (USJ); Parque Nacional Braulio Carrillo, Estación El Ceibo, bosque entre la Estación y la margen izquierda del Río Peje, 10°19′45″N, 84°04′50″W, 500 m, 8 Dec. 1989 (fl), *A. Chacón 596* (CR, MO, USJ). **Puntarenas:** Cantón de Osa, Fila Costeña, Fila Cruses, cabeceras del Río Piedras Blancas, 8°49′02″N, 83°11′25″W, 900 m, 7 Dec. 1993 (fl), *Hammel et al. 19193* (CR, INB).

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Literature Cited

Daniel, T. F. 1993. Taxonomic and geographic notes on Central American Acanthaceae. Proc. Calif. Acad. Sci. 48: 119–130.

——— & D. C. Wasshausen. 1990. Three new species of *Justicia* (Acanthaceae) from Panama. Proc. Calif. Acad. Sci. 46: 289–297.

Durkee, L. H. 1978. Acanthaceae. *In:* Flora of Panama. Ann. Missouri Bot. Gard. 65: 155–284.

———. 1986. Acanthaceae. *In:* Flora Costaricensis. Fieldiana, Bot., new series N. 18: 1–87.

Goméz-Laurito, J. 1990. Two new species from the Caribbean of Costa Rica. Brenesia 33: 139–144.

——— & M. Grayum. 1991. *Herpetacanthus stenophyllus* (Acanthaceae), a new species from Costa Rica. Novon 1: 15–16.

McDade, L. A. 1982. New species of *Justicia* and *Razisea* (Acanthaceae) from Costa Rica, with taxonomic notes. Syst. Bot. 7: 489–497.

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Figure 7. Scanning electron photomicrographs of Acanthaceae pollen. —A. *Habracanthus tilaranensis* (*Haber & Bello 5996*). —B. *Justicia aurantiimutata* (*Castro 19*). —C. *Justicia deaurata* (*Hammel 17981*). —D. *Justicia peninsularis* (*Herrera 44431*). —E. *Kalbreyeriella rioquebradasiana* (*Hammel 17957*). —F. *Razisea villosa* (*Herrera & Fallas 4641*). Scales equal 10 μm.

The *Tillandsia adpressa* Assemblage: A Review and New Combinations in *Racinaea* (Bromeliaceae: Tillandsioideae)

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ABSTRACT. Studies of the Bromeliaceae have led to a reevaluation of the four-taxa *Tillandsia adpressa* André assemblage. Herbarium research and field studies show that three of the taxa in the assemblage should be recognized at the specific rank, while the remaining one should be transferred to subspecific status. All taxa are transferred to *Racinaea* as follows: *R. adpressa* (André) J. R. Grant, *R. adpressa* subsp. *orthiantha* (Standley) J. R. Grant, *R. miniata* (Rauh) J. R. Grant, and *R. schumanniana* (Wittmack) J. R. Grant. A discussion of the nomenclature, lists of exsiccatae, and a key to the taxa are provided.

The *Tillandsia adpressa* André assemblage has been treated in several manners. Smith (1930) created the "assemblage" by reducing *Tillandsia tonduziana* Mez and *T. orthiantha* Standley to varietal status under *T. adpressa* and placing *T. schumanniana* in synonymy with *T. tonduziana*. Mez in Engler (1935) returned each of these taxa to specific rank and arranged the taxa into two groups. Mez placed *T. schumanniana* near *T. orthiantha*, and *T. adpressa* near *T. tonduziana*, in different species groups. Standley (1937) followed Smith (1930) and treated *T. tonduziana* and *T. orthiantha* as varieties of *T. adpressa*, but did not mention either *T. schumanniana* or the typical form. Rauh (1974) examined the group further and described an additional variety, *T. adpressa* var. *miniata*. Smith & Downs (1977) followed the taxonomy of Smith (1930), but overlooked Rauh's new variety. Based on obovate, asymmetric sepals, the taxa comprising the *T. adpressa* assemblage are here transferred to *Racinaea* M. A. Spencer & L. B. Smith (Spencer & Smith, 1993), previously *Tillandsia* subg. *Pseudocatopsis*.

Although both Smith (1930) and Rauh (1974) considered the four taxa to be closely related, I believe that the group is not monophyletic. Both *Racinaea adpressa* and *R. adpressa* subsp. *orthiantha* are more closely related to *R. cuspidata* than either *R. miniata* or *R. schumanniana;* the latter two are more closely related to other elements including *R. tetrantha*.

KEY TO THE TAXA OF THE *RACINAEA ADPRESSA* "ASSEMBLAGE"

1a. Plants caulescent; leaves short and many; flowering plants 9–12 cm tall; branches of inflorescence inconspicuous, 3–7 mm long, sessile, with 1–4 small clustered flowers ..... *R. miniata*
1b. Plants acaulescent; leaves longer and fewer; flowering plants 13–38 cm tall; branches of inflorescence distinct, 6–55 mm long, pedicellate, dense to laxly 4–13-flowered.
  2a. Scape and inflorescence usually completely erect at anthesis, pendent in fruit, the rachis linear to slightly flexuous; branches of inflorescence spreading to reflexed at maturity, diffusely flowered.
    3a. Sepals 4–5 mm long . *R. schumanniana*
    3b. Sepals 6–9 mm long ..... *R. tetrantha*
  2b. Scape erect to arching, rachis strictly linear, narrowly cylindric to claviform in outline; the inflorescence declinate to pendent; branches of inflorescence strictly appressed to the rachis, densely flowered.
    4a. Sepals and floral bracts cuspidate .. .. *R. cuspidata*
    4b. Sepals and floral bracts no more than apiculate.
      5a. Sepals 5–6 mm long, shorter to equaling the floral bracts; lower primary bracts ½–¾ the length of the subtending branch; plants of Colombia, Ecuador, and Peru . .....*R. adpressa* subsp. *adpressa*
      5b. Sepals 7–9 mm long, exceeding the floral bracts; lower primary bracts exceeding the subtending branch; plants of Costa Rica and Panama .... *R. adpressa* subsp. *orthiantha*

1. Racinaea adpressa (André) J. R. Grant, comb. nov. Basionym: *Tillandsia adpressa* André, Énum. Bromel. 6. 13 Dec. 1888. TYPE: Ecuador. Pichincha: Pululahua Volcano, June 1876, *André 3792* (holotype, K; photos GH, US).

Most specimens of *Racinaea cuspidata* at US have been incorrectly identified as *R. adpressa*. *Racinaea adpressa* is similar to *R. cuspidata* in having erect branches but differs in its generally broader leaf blades, reflexing (not erect to spreading)

flowers, and separate geographical distribution, i.e., separate slopes of the Andes (Luther, pers. comm.). Its lateral branches that are appressed to the rachis, an erect to arching scape, and declinate to strictly pendent inflorescence also separate it from both *R. miniata* and *R. schumanniana*.

Smith (1930) stated that the only character differentiating *Tillandsia adpressa* from *T. schumanniana* was the erect nature of its branches. He also stated that *Tillandsia orthiantha* only differed from *T. adpressa* by a more densely flowered inflorescence. Recent collections show an overall wider range of characters in specimens than those available to Smith (1930). They do, however, also exhibit characters that show clearer species trends. *Racinaea adpressa* subsp. *adpressa* differs from *R. adpressa* subsp. *orthiantha* by a distinctly cylindriform vs. claviform inflorescence outline, lateral branches that are less compactly situated along the rachis, shorter sepals, and bracts that do not exceed their subtending branches. Observations from fresh flowers have not been made to date.

Specimens examined. ECUADOR. **Pichincha:** Chiriboga, old road Quito–Santo Domingo, 15 July–15 Oct. 1983, *Hirtz 1027* (SEL); old road from La Palma to Quito via Chiriboga, 23 Oct. 1989, *Luther, Kress, Brown & Roesel 2762* (SEL). **Imbabura:** along the Río Crystal E of Lita, 5 Dec. 1991, *Girko E91D 051* (SEL).

2. Racinaea adpressa subsp. **orthiantha** (Standley) J. R. Grant, comb. et stat. nov. Basionym: *Tillandsia orthiantha* Standley, J. Wash. Acad. Sci. 17: 248. 1927. *Tillandsia adpressa* André var. *orthiantha* (Standley) L. B. Smith, Contr. Gray Herb. 89: 9. 1930. TYPE: Costa Rica. San José: Laguna de la Chonta, NE of Santa María de Dota, 2,000–2,100 m, 18 Dec. 1925, *Standley 42312* (holotype, US).

Racinaea adpressa subsp. *orthiantha*, which ranges from Costa Rica to Panama, is perhaps the most poorly known of the four taxa that make up the assemblage. *Racinaea adpressa* subsp. *orthiantha* differs from the sympatric *R. schumanniana* by a stout, erect inflorescence and densely flowered spikes, which are erect and appressed to the rachis. I place it at the subspecific rank because I believe it better reflects the relationship of *orthiantha* to *adpressa* than the varietal does.

Paratype. COSTA RICA. **San José:** Laguna de la Chonta, NE of Santa María de Dota, 2,000–2,100 m, 18 Dec. 1925, *Standley 42348* (US).

Specimens examined. COSTA RICA. **Alajuela:** near main entrance to Parque Nacional Volcán Poás, just outside of the park, 15 Jan. 1991, *Grant 91-01401, Rundell & Ramirez* (CR, US). **Cartago:** Cartago, 6,000 ft., 15 Dec. 1948, *Foster 2687* (US), *Foster 2688* (US); 22 mi. S of Cartago on Inter-American Hwy., N slope Talamanca Mts., Station 29, 17 July 1962, *Haines & Haines 726* (US), *Haines & Haines 739* (US); 18 mi. S of Cartago on Inter-American Hwy., 0.1 mi. SW of El Empalme, N side of Talamanca Mts., Station 53, 5 Aug. 1962, *Haines & Haines 767* (US). PANAMA. **Chiriquí:** along trail N of Cerro Punta, 29 May 1970, *Croat 10516* (US).

3. Racinaea miniata (Rauh) J. R. Grant, comb. et stat. nov. Basionym: *Tillandsia adpressa* André var. *miniata* Rauh in Abh. Akad. Wiss. Lit. Mainz, Math.-Naturwiss. Klasse, Trop. Subtrop. Pflanzenwelt 13: 5. 1974. TYPE: Ecuador. Tungurahua: 20 km Baños versus via Puyo, July 1973, *Rauh 34820* (holotype, HEID not seen; isotype, US).

Racinaea miniata is easily separated from the other taxa in the assemblage by its caulescence, clustered growth habit, much smaller size, short, narrow leaves, short inflorescence, and reduced, inconspicuous lateral branches with only 1–4 flowers.

Specimens examined. COLOMBIA. **Antioquia:** along the road Ventanas–El Cedro, 1,700 m, 15 Mar. 1989, *Dalstrom 1283* (SEL). ECUADOR. **Napo:** wet forest near Baeza, 1,900 m, 23 Feb. 1982, *Luer & Hirtz 7014* (SEL). **Morona–Santiago:** vic. Limón, ca. 1,300 m, 3 July 1989, *Girko E89033* (SEL). PERU. **San Martín:** Vic. Moyabamba, *Soerries* 1984 (SEL).

4. Racinaea schumanniana (Wittmack) J. R. Grant, comb. nov. Basionym: *Catopsis schumanniana* Wittmack, Bot. Jahrb. 11: 70. 1890. *Tillandsia schumanniana* (Wittmack) Mez, DC. Monogr. Phan. 9: 740. 1896. TYPE: Colombia. Antioquia: Amalfi, 2,000 m, 22 Sep. 1884, *Lehmann XXII* (holotype, G not seen; photos SEL, US).

Tillandsia tonduziana Mez, Bot. Jahrb. 30, (Beibl. 67): 9. 1901. *Tillandsia adpressa* André var. *tonduziana* (Mez) L. B. Smith, Contr. Gray Herb. 89: 8. 1930. TYPE: Costa Rica. San José: La Palma, *Tonduz 9708* (holotype, BR not seen; photos GH, US).

Racinaea schumanniana, the most wide-ranging of the four taxa in the assemblage, is also the most morphologically variable. Ranging from Costa Rica to Bolivia, it is characterized by an erect inflorescence with conspicuous lateral branches spreading at about a 45° angle. The typical length of the inflorescence is 25–38 cm long, but is much reduced (to 13 cm) in depauperate specimens (e.g., *Girko E90-20*, SEL).

In addition to morphological characters, the taxa can be further differentiated by recent observations from the field. Luther (pers. comm.) has found that in Ecuador *Racinaea schumanniana* and *R. min-*

iata are sympatric, while *R. adpressa* is found on geographically separate slopes of the Andes. My own observations in Costa Rica have shown that *R. schumanniana* and *R. adpressa* subsp. *orthiantha* are sympatric.

Specimens examined. COSTA RICA. **Alajuela:** NW of San Ramón, km 23 Balsa Road to Fortuna, near the waterfall of San Ramón, 18 Feb. 1990, *Grant 90-00795, Hall, Wright & Williams* (CR, US). **Cartago:** El Muneco, on the Río Navarro, 1,400–1,500 m, 06–07 Mar. 1926, *Standley 51667 & Torres R.* (US). **Limón:** Guapiles, Los Angeles, San Miguel, between the Río Blanquito and the Río Blanco, 1,300 m, 21 Feb. 1990, *Grant 90-00826* (CR, US). **Puntarenas:** Monteverde Reserve, 2 km SW of station, 10°18′N, 84°48′W, 1,500–1,550 m, 19 Nov. 1992, *Ingram 1754 & Ferrell-Ingram* (SEL). **San José:** SW slope of Cerro San Francisco, along the road from Santa María de Dota to El Empalme, 1 km SE of Jardín, 2,150 m, 27 Feb. 1990, *Grant 90-00891 & Grayum* (CR, US). PANAMA. **Chiriquí:** Bajo Chorro, Bogneti District, 13 Feb. 1938, *Davidson 280* (US). COLOMBIA. **Antioquia:** along the road Ventanas–El Cedro, 1,700 m, 15 Mar. 1989, *Dalstrom 1284* (SEL). **Boyaca:** Sierra Nevada del Cocuy, near Bachira, 2,100 m, 20 Aug. 1957, *Grubb 615, Curry & Fernandez-Perez* (US). **Santander:** Eastern Cordillera, S slope of Mount San Martin, near Charta, 2,300–2,500 m, 10 Feb. 1927, *Killip 19197 & Smith* (US). **Valle:** La Cumbre, Cordillera Occidental, 1,800–2,100 m, 14–19 May 1922, *Pennell 5746 & Killip* (US). VENEZUELA. **Falcón:** Sierra de San Luis, entre La Tabla y la bifurcación de la carretera hacia el Hotel Parador, 1,000–1,300 m, 18 July 1967, *Steyermark 99053-A* (US). **Zulia:** Campamento Frontera VI, on tepui-like sandstone ridge 4 by 0.5–1 km running E–W, E of the international border, between the headwaters of the Río del Norte and the southernmost branch of Río Aricuaisa, 9°30′N, 73°06′W, 2,400 m, 23–28 July 1974, *Berry 170* (US). ECUADOR. **Loja:** Cordillera de Sabanilla, 15 km S of Yangana, 2,480 m, 31 Dec. 1980, *M. & D. Madison & L. & A. Besse 7451* (SEL, US). **Morona–Santiago:** 8 km S of San Juan Bosco, 1,600 m, 02 Jan. 1981, *M. T. & D. Madison & L. & A. Besse 7545* (SEL). **Napo:** Cosanga, km 112 Quito–Tena, 1,850 m, 17 June 1983, *C. H. & P. M. Dodson, Benzing & Hirtz 14012* (SEL). **Pastaza:** along new road N Mera, 1,400 m, 10 Jan. 1986, *Dalstrom & Hoijer 1028* (SEL). **Sucumbios:** Gonzalo Pizarro Canton, Parroquia Reventador, Pre-Cooperativa Garcia Moreno, Tercera Linea al N de la carretera, cerca al Rio Due, 77°35′W, 00°03′N, 1,800 m, 23 May 1990, *Ceron & Ayala 9866* (SEL). **Tungurahua:** near Baños, 1,500 m, 26 Feb. 1973, *Rauh 34821* (US). **Zamora–Chinchipe:** along road Guisme–Condor, 1,700 m, 19 Jan. 1989, *Hoijer & Dalstrom 1167* (SEL). PERU. **Amazonas:** ca. 17 trail km E of La Peca in Serrania de Bagua, 1,850–1,900 m, 14 June 1978, *Gentry 23011, Dillon, Aronson, Diaz, & Barbour* (US). **Huanuco:** near Tingo María, May 1984, *Sorries s.n.* (SEL). **San Martín:** roadside at km 12 Tarapoto–Yuri–Maguas, 13 Sep. 1981, *Luther, Besse & Halton 702* (SEL). BOLIVIA. **La Paz:** Larecaja, Tipuani Valley, Hacienda Casana, 02 Dec. 1922, 1,400 m, *Buchtien 7188* (US); km 19 Coroico–La Paz, 1,850 m, Jan. 1983, *Besse s.n.* (SEL).

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Literature Cited

Mez, C. 1935. *In* A. Engler, Das Pflanzenreich. Regni vegetabilis conspectus. Im Auftrage der Preuss. Akademie der Wissenschaften. IV. 32. Bromeliaceae. (Bogen 31–42). Leipzig. 500–513.

Rauh, W. 1974. Bromelienstudien I. Neue und wenig bekannte Arten aus Peru und anderen Landern (4. Mitteilung). Abh. Akad. Wiss. Lit. Mainz, Math.-Naturwiss. Klasse, Trop. Subtrop. Pflanzenwelt 113: 5–16.

Smith, L. B. 1930. Studies in the Bromeliaceae—I. Contr. Gray Herb. 89: 8–9, 40–41.

——— & R. J. Downs. 1977. Tillandsioideae (Bromeliaceae). Flora Neotropica Monograph no. 14. pt. 2: 1049–1050. Hafner Press, New York.

Spencer, M. A. & L. B. Smith. 1993. *Racinaea*, A new genus of Bromeliaceae (Tillandsioideae). Phytologia 74: 151–160.

Standley, P. C. 1937. Flora of Costa Rica, Part I. Botanical Series. Field Museum of Natural History. Volume XVIII. Publication 391. Chicago, Field Museum Press. 157.

Nephthytis Schott (Araceae) in Borneo: A New Species and New Generic Record for Malesia

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ABSTRACT. *Nephthytis bintuluensis* A. Hay, Bogner & P. C. Boyce is here first described from plants collected near Bintulu, Sarawak, East Malaysia. The genus was hitherto known only from western tropical Africa.

During fieldwork in January/February (A. H.) and February/March (J. B. & P. C. B.) 1994 pertaining to the preparation of accounts of Araceae for *Flora Malesiana* (Hay, 1994) and related projects, several small populations of an aroid, including a single flowering individual and two in fruit, not matching any Malesian genus, were found in remnant lowland rainforest near Bintulu in Sarawak, East Malaysia. Attention had originally been drawn to the existence of this plant by Arden Dearden, a private horticultural collector in Queensland, Australia, who had found it, sterile, in 1990.

Nephthytis bintuluensis A. Hay, Bogner & P. C. Boyce, sp. nov. TYPE: East Malaysia. Sarawak: Bintulu, 2.3 km from bridge over Batang Kemena along road to Sibu, approximately 3°08′N, 113°05′E, 6 Feb. 1994, *Hay, Yahud, Saupel & Chan 9376* (holotype, SAR). Figure 1.

Ab aliis speciebus *Nephthytidis* rhizomate hypogaeo, folio unico, venis primariis lateralibus inferioribus lobi antici valde patentibus, spadice sessile, stylo breve differt.

Solitary deciduous geophytic herb. Rhizome to ca. 40 cm long, often very straight and physiognomically unbranched (but cf. Fig. 1), sympodial, usually horizontal, completely hypogeal, ca. 1.2–2.0 cm thick, whitish, bearing the scars of numerous cataphylls and occasional leaves and inflorescences, internodes ca. 5 mm long, roots rather short, brittle, often somewhat sparse, few-branched. Leaf always solitary (except in one observed juvenile with two), probably long-lived (epiphyllous cryptogams sometimes abundant), with the rhizome elongating several centimeters beyond its insertion, unarmed. Petiole erect, smooth, straight, slender, to ca. 90 cm long, mottled green and ivory, with a hardly thickened apical genicular zone ca. 4–10 cm long. Blade to ca. 60 cm long, hastosagittate, held obliquely with the posterior lobes down, mid-green, becoming dark green in old leaves, sometimes irregularly spattered ivory-white; anterior lobe subequaling the posterior lobes in length, ± narrowly oblong-ovate, flaring rather abruptly at the marginal junction with the posterior lobes at a level 4–8 cm distal to the junction of the anterior and posterior costae, the tip acute, somewhat acuminate; posterior lobes ± narrowly ovate, acuminate-tipped; venation reticulate throughout, primary lateral veins of costae impressed adaxially, prominent abaxially, mostly diverging at ca. 40–45°, except in the anterior lobe between the levels of the junction of anterior and posterior costae and the marginal junctions of the anterior and posterior lobes, wherein the primary lateral veins diverge at a much higher angle (up to ca. 85°), the posterior costae naked in the sinus for ca. 1.5 cm. Inflorescence solitary, terminal, separated from the foliage leaf by up to several centimeters of rhizome bearing the scars of previous inflorescences, subtended by a series of ivory-colored cataphylls of increasing length, the last reaching almost to the base of the spathe. Peduncle erect, ca. 17 cm long, slightly thicker than the petiole, smooth, pale greenish ivory. Spathe ca. 6.4 cm long, rather narrowly ovate when flattened, canoe-shaped (observed prior to anthesis), erect, ivory-white, somewhat coriaceous, unconstricted, with an ascending acumen 1.8 cm long and reflexed distally, the margins convolute basally. Spadix ca. 5 cm long, ca. 1.1 cm thick, sessile with oblique insertion, fertile male and female zones contiguous, appendix absent;

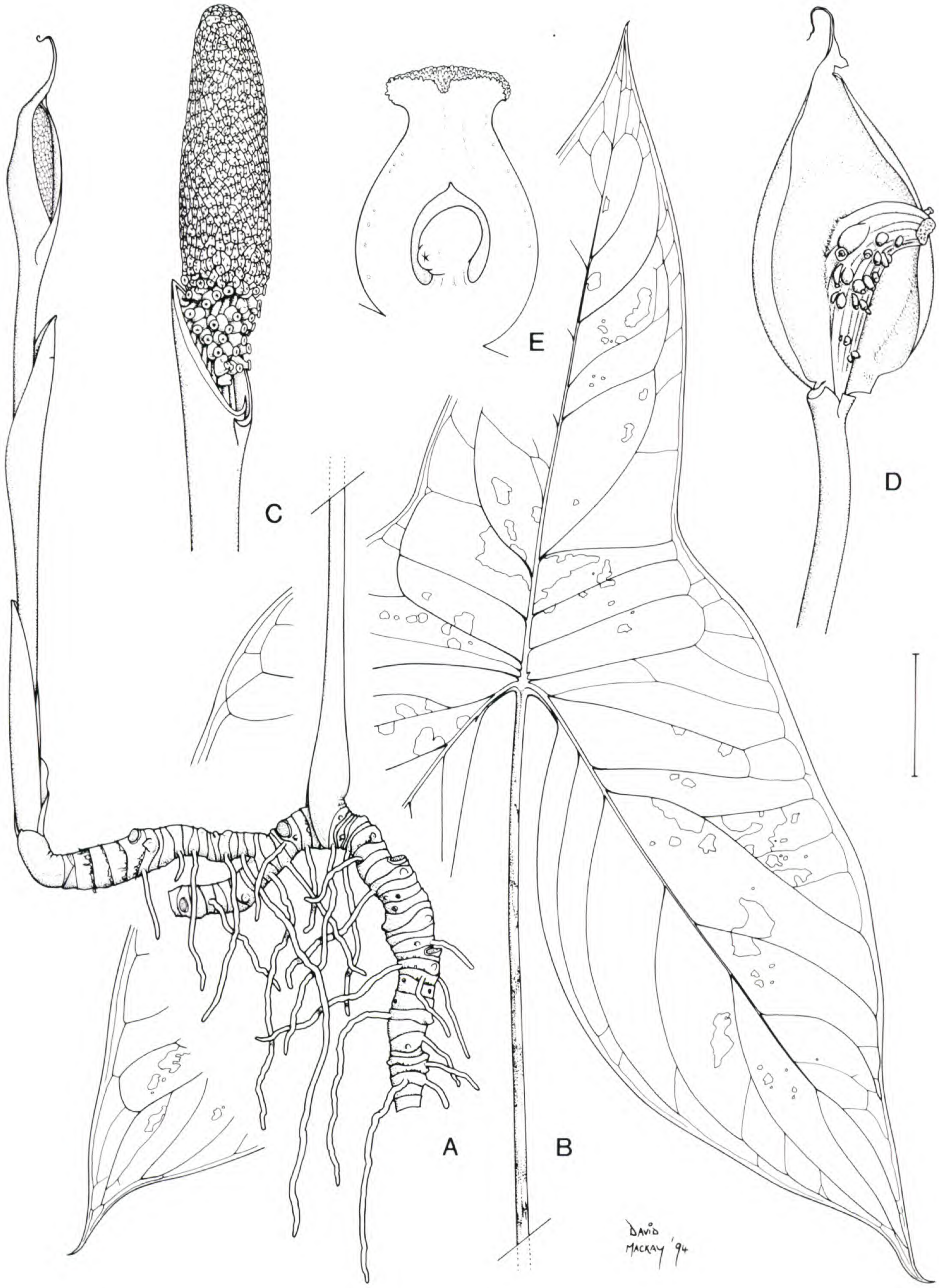

Figure 1. *Nephthytis bintuluensis* A. Hay, Bogner & P. C. Boyce, sp. nov. (based on *Hay et al. 9376*). —A. Rhizome with petiole base and inflorescence. —B. Leaf blade with outlines of variegation patterns. —C. Spadix. —D. Infructescence. —E. Pistil in longitudinal section. Scale bar for A, B = 3.5 cm; C, D = 1.5 cm; E = 1 mm.

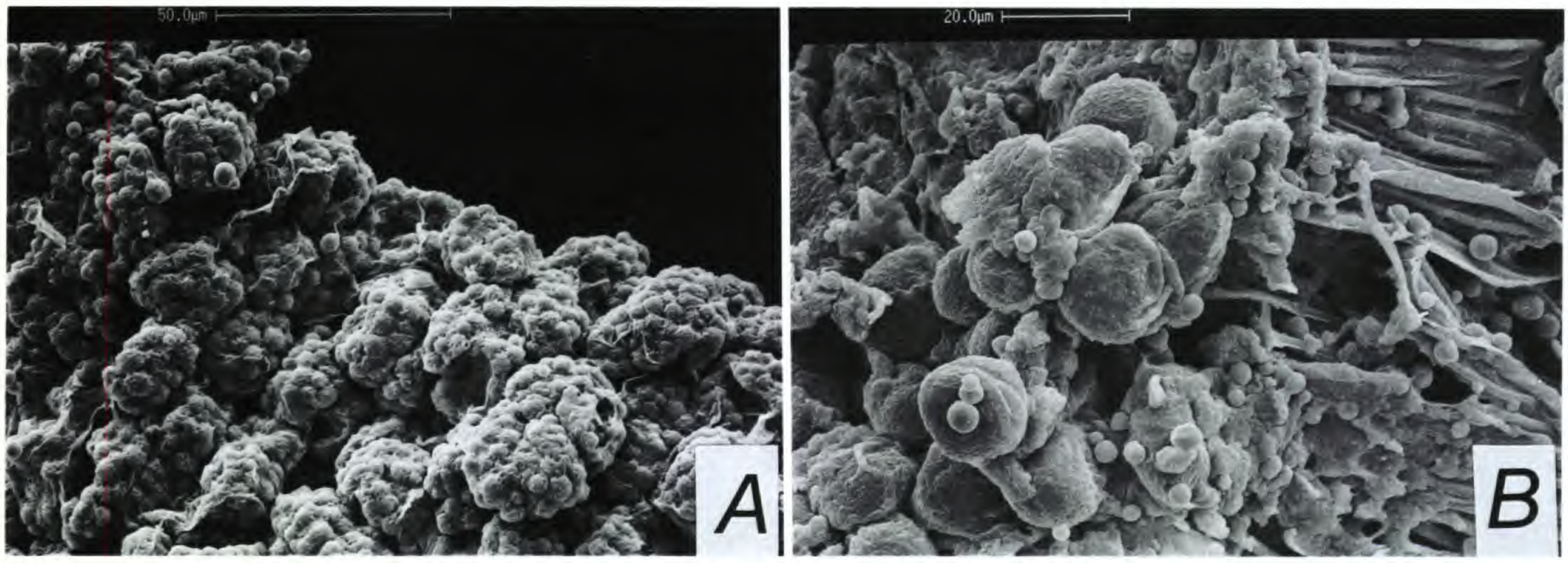

Figure 2. Scanning electron micrographs of pollen of *Nephthytis bintuluensis* (*Hay et al. 9376*). —A. Pollen grains completely covered by caducous subspherical verrucae. —B. Pollen grains (slightly collapsed) after most of the verrucae have fallen.

female zone ca. 1.2 cm long; pistils naked, not very close-packed, ca. 2.5 mm long × ca. 1.2 mm diam., flask-shaped; stigma buttonlike, impressed centrally, minutely papillate, yellowish, raised on a short style; ovary unilocular; ovule solitary, anatropous, basal; male zone ca. 3.4 cm long, slightly tapering and blunt-tipped, ivory-white; individual male flowers hardly recognizable as such, ?3–4-merous, the male zone ostensibly a mass of stamens; stamens with very short, thick filaments; anthers truncate, with two thecae and four pollen sacs, ca. 1 × 1.5 mm across, dehiscence not observed; pollen grains ± globular, ca. 20–28 µm diam., inaperturate, the rough exine covered with very easily dislodged ± spherical verrucae of variable size ca. 2–4 µm diam. (Fig. 2). Infructescence terminal (i.e., not displaced by further growth of rhizome until it has died), the peduncle not significantly enlarging after anthesis; spathe persistent, ± wide open except for the somewhat inrolled margins, green marginally and distally, otherwise orange like the spadix and fruits; male portion of spadix deciduous, the female portion of the spadix axis somewhat enlarged; fruit subglobose, ca. 1.5 cm diam., bright orange; pericarp juicy, ca. 2–4 mm thick, orange; seed exalbuminous, without seed coat, hilum large, triangular, and somewhat sunken, embryo large, green, ellipsoid, ca. 1.2 × 1.0 cm, plumule well developed and darker than rest of embryo. Chromosome number $2n = 36$.

Distribution. Known only from the type locality in lowland dipterocarp forest floor, or relictually in regrowth, usually on steep to moderate slopes, at ca. 150 m altitude.

We found the plants in very small remnant patches of lowland dipterocarp forest, growing both in the disturbed margin and in the understory. Since they seem to be slow-growing, it would appear that those in the disturbed forest margin had persisted since prior to disturbance rather than become established afterwards. The single leaf in all observed adult individuals suggests that this plant is deciduous (other species of *Nephthytis* are evergreen—although the modules of the sympodium bear only one foliage leaf, the rhizome is multifoliar, or in unifoliar instances, e.g., *N. afzelii* Schott var. *graboensis* Bogner & Knecht (ined.), the break in leaf succession is not long enough to constitute a "resting" period). Most individuals had a fully expanded but young-looking leaf, while a few had evidently much older leaves (dark green and many epiphylls), which were nevertheless solitary. Dearden (pers. comm.) reported that in his cultivated plants of this species there is a distinct leafless resting period of several weeks. *Nephthytis bintuluensis* is geophytic, with the rhizome always completely buried up to ca. 15 cm deep in soil well below the litter layer, unlike the remainder of the genus where the rhizome creeps at the soil surface. The chromosome count of 36 for *N. bintuluensis* differs from the African species, in which $2n = 40$ or 60 (Petersen, 1989).

The new species is placed in *Nephthytis* because of the combination of laticifers, sympodial rhizomatous habit with each leaf subtended by cataphylls, entire hastosagittate [(sub-)triangular in *N. mayombensis* de Namur & Bogner (de Namur & Bogner, 1994) and *N. hallaei* (Bogner) Bogner (Bogner, 1969, 1980)] leaf blade with reticulate venation, monoecious spadix with naked unisexual flowers, the female zone not connate with the spathe, no appendix, truncate stamens, inaperturate pollen with caducous (cf. Thanikaimoni, 1969) verrucae, spathe persistent in infructescence, the large exalbuminous seed without seed coat (Seubert, 1993), conspicuous

hilum and green embryo, and in overall appearance (the latter factor further reducing the viability of argument that the individual generic characters of *Nephthytis* had arisen independently in this highly disjunct species). *Nephthytis* is separated from *Callopsis*, the only other genus in which placement of this species could be considered, on the basis of the female zone of the spadix being entirely adnate to the spathe in *Callopsis*, but free in *Nephthytis* [Bogner (1980) transferred his *C. hallaei* (Bogner, 1969) in which the female zone is free, into *Nephthytis*], and in the seed being albuminous in *Callopsis* and exalbuminous in *Nephthytis* (Bogner, 1980; Seubert, 1993). Bogner (1980) and Grayum (1984, 1992) also noted that the exine surface is spinulose in *Callopsis* and verruculose (or verrucate) in *Nephthytis*, the latter also observed by Knecht (1983). Moreover, the spathe is conspicuously petaloid in *Callopsis*, while it is bractlike in *Nephthytis*.

Immediate allies of *Nephthytis* are scandent *Cercestis* (including *Rhektophyllum*) and deciduous geophytic *Anchomanes* and *Pseudohydrosme* (Bogner & Nicolson, 1991; Knecht, 1983). Though Grayum (1990) placed *Anchomanes* and *Pseudohydrosme* in a separate tribe, he included it in his "*Nephthytis* alliance." Also allied are *Callopsis* (already mentioned) and *Culcasia*. All of these genera are tropical African, *Nephthytis* itself hitherto restricted to rainforest areas of western tropical Africa. The last genus consensually allied with these is the soboliferous, arborescent neotropical *Montrichardia*. Until now, no species of any genus of the *Nephthytis* alliance has been recorded naturally anywhere in the Indomalesian region. This find brings the number of aroid genera recognized for Malesia to 34 in a checklist of Australian, Malesian, and tropical western Pacific Araceae recently compiled by Hay et al. (in prep.).

While many angiosperm genera extend through tropical Africa and Indomalesia [including *Rhaphidophora*, *Arisaema*, *Amorphophallus*, *Remusatia*, *Sauromatum*, and *Pothos* (Madagascar) in the Araceae], Malesian–African tropical disjunctions were not known in aroids (Croat, 1979; Hay & Mabberley, 1991) and do not seem to be common generally. Examples from other families are *Ganophyllum* (Sapindaceae), *Allantospermum* (Ixonanthaceae, Madagascar and Malesia), *Nesphostylis* (Leguminosae–Papilionoideae, tropical Africa and Burma), and *Petersianthus* (Lecythidaceae) (Mabberley, pers. comm. and 1987).

Paratypes. EAST MALAYSIA. **Sarawak:** same locality as holotype, *Bogner 2164* (M, MO, US), *Boyce 727* (K), *Hay et al. 9307* (sterile, SAR; also cult. Hort. Reg. Bot. Sydney, accession no. 940461); Cultivated, Cairns, Queensland, Australia, ex Bintulu, Sarawak, *Dearden s.n.* (sterile, NSW).

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Literature Cited

Bogner, J. 1969. Une nouvelle espèce du genre *Callopsis* Engl. (Aracées) et considérations taxonomiques sur ce genre. Adansonia sér. 2, 9: 285–291.

———. 1980. On two *Nephthytis* species from Gabon and Ghana. Aroideana 3 : 75–85.

——— & D. H. Nicolson. 1991. A revised classification of the Araceae with dichotomous keys. Willdenowia 21: 35–50.

Croat, T. B. 1979. The distribution of Araceae. Pp. 291–308 *in* K. Larsen & L. Holm-Nielsen (editors), Tropical Botany. Academic Press, London.

Grayum, M. H. 1984. Palynology and Phylogeny of the Araceae. Univ. Microfilms International, Ann Arbor, Michigan.

———. 1990. Evolution and phylogeny of the Araceae. Ann. Missouri Bot. Gard. 77: 628–697.

———. 1992. Comparative External Pollen Ultrastructure of the Araceae and Putatively Related Taxa. Monogr. Syst. Bot. Missouri Bot. Gard. 43: 1–167.

Hay, A. 1994. Araceae: An internationally co-ordinated major family for the accelerated Flora Malesiana Project. Flora Malesiana Bull. 11: 202–205.

——— & D. J. Mabberley. 1991. 'Transference of Function' and the origin of aroids: Their significance in early angiosperm evolution. Bot. Jahrb. Syst. 113: 339–428.

Knecht, M. 1983. Contribution à l'étude biosystematique des représentants d'Aracées de la Côte d'Ivoire. Phanerogamarum Monographiae Vol. 17. J. Cramer, Vaduz.

Mabberley, D. J. 1987. The Plant-book. Cambridge Univ. Press, Cambridge.

Namur, Ch. de & J. Bogner. 1994. Une nouvelle espèce de *Nephthytis* Schott (Araceae) en République du Congo. Adansonia sér. 4, 16: 71–74.

Petersen, G. 1989. Cytology and systematics of Araceae. Nordic J. Bot. 9: 119–166.

Seubert, E. 1993. Die Samen der Araceen. Koeltz, Koenigstein.

Thanikaimoni, G. 1969. Esquisse palynologique des Aracées. Inst. Franç. Pondichéry, Trav. Sect. Sci. Tech. 5(5): 1–31.

New Taxa of Gentianaceae from China

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ABSTRACT. The taxa *Gentiana densiflora* T. N. Ho, *G. kunmingensis* S. W. Liu, *G. myrioclada* var. *wuxiensis* T. N. Ho & S. W. Liu, *G. xingrenensis* T. N. Ho, and *Swertia luquanensis* S. W. Liu are described as new. The new combinations *G. cephalantha* Franchet ex Forbes & Hemsley var. *vaniotii* (Léveillé) T. N. Ho, *G. davidii* Franchet var. *fukienensis* (Ling) T. N. Ho, *G. lawrencei* Burkill var. *farreri* (I. B. Balfour) T. N. Ho, *G. ninglangensis* T. N. Ho var. *glabrescens* (Harry Smith) T. N. Ho, *G. prostrata* Haenke var. *ludlowii* (Marquand) T. N. Ho, *G. pulvinarum* W. W. Smith subsp. *subtilis* (Harry Smith) T. N. Ho, *G. stipitata* Edgeworth subsp. *tizuensis* (Franchet) T. N. Ho, *G. suborbisepala* Marquand var. *kialensis* (Marquand) T. N. Ho, *G. trichotoma* Kusnezow var. *chingii* (Marquand) T. N. Ho, *G. wardii* W. W. Smith var. *emergens* (Marquand) T. N. Ho, and *Swertia wardii* Marquand var. *rigida* (T. N. Ho & S. W. Liu) T. N. Ho are proposed.

Gentiana densiflora T. N. Ho, sp. nov. TYPE: China. Sichuan: Chengkou, 1,500 m, 16 Apr. 1958, *L. T. Dai 100047* (holotype, HNWP).

Inter species sect. *Chondrophyllarum* Bunge ser. *Fastigiatarum* T. N. Ho foliis caulinis obovatis vel spathulatis, marginibus calycis anguste membranaceis et laevibus, ramulis confertis ceteras excellens.

Annuals 3–13 cm tall. Stems erect, purple, fastigiate-branched at base, with short slender branches and 2–6 crowded flowering branches, papillate. Basal leaves withered at anthesis, petiole 2–3 mm long; blade ovate to broadly ovate, 10–25 × 7–13 mm, margin cartilaginous and ciliolate, apex obtuse; veins 1–3, slender. Cauline leaves widely spaced; connate sheathing bases 1–1.5 mm long, abaxially papillate; blade spatulate to obovate, 5–15(–20) × 2–10(–15) mm, shorter than internodes, gradually smaller toward stem apex, margin narrowly membranous and ciliolate, apex rounded; veins 1–3, slender. Flowers many. Pedicel purple, 2–3.5 mm long, papillate, subtended by upper leaves. Calyx narrowly obconic, 5–6.5 mm long, lobes broadly triangular, 1–2 mm long, margins narrowly membranous and smooth, midvein prominent, apex acute and apiculate. Corolla pale yellow-green outside, pale blue inside, tubular, 1–1.3 cm long; lobes ovate, 1.5–2 mm long, margin entire, apex obtuse; plicae semiorbicular, 0.8–1 mm long, margin entire or crenulate, apex obtuse. Stamens inserted at middle of corolla tube, equal, filaments 2.5–3 mm long; anthers narrowly oblong, 1.3–1.5 mm long. Style 1–1.5 mm long. Gynophore to 1.8 cm long, stout. Capsules spatulate to obovate, 4.5–6 mm long, conspicuously winged. Seeds brown, oblong to ellipsoid, 1–1.2 mm long, minutely reticulate.

Gentiana densiflora is a distinctive species, easily recognized by its having crowded flowering branchlets and narrowly membranaceous and smooth leaf margins and calyx lobes. It is only distantly allied to the remaining members of section *Chondrophyllae* ser. *Fastigiatae*. It does, however, clearly belong to this series because of its fastigiate branches and triangular calyx lobes.

Paratypes. CHINA. **Sichuan:** Nanchuan, 800–900 m, 31 May 1928, *W. P. Fang 1177* (PE); Nanchuan, 1,300–1,800 m, 5–28 Apr. 1957, *J. H. Xiong 90155 & 90556* (SZ); Wushan, 2,040 m, 16 Apr. 1964, *G. H. Young 57904* (PE). **Hubei:** Fenjie, 1,200 m, 25 Apr. 1964, *H. F. Zhou & H. Y. Su 107812* (SZ); Fenjie, 1,800 m, 1 June 1964, *H. F. Zhou & H. Y. Su 108401* (SZ). **Guizhou:** Fanjing Shan, 11 May 1959, *Qian bei exped. 833* (PE).

Gentiana kunmingensis S. W. Liu, sp. nov. TYPE: China. Yunnan: Kunming, 26 Apr. 1957, *B. Y. Qiu 54533* (holotype, KUN).

Inter species sect. *Chondrophyllarum*, *Gentianae maeulchanensi* Franchet similis, differt foliis et calycibus pubescentibus, corolla flavida, calycem paullo superante, staminibus aequilongis.

Annuals or biennials, 2–5 cm tall. Stems erect, rigid, fastigiate-branched at base, flowering branches crowded into a capitulum, papillate toward apex. Basal leaves with petiole 1–3 mm long; blade spatulate, oblanceolate, or obovate, 5–22 × 3–13 mm, densely pubescent, margin densely ciliolate, apex rounded, midvein prominent. Cauline leaves petiolate, blade 5–11 × 1.5–3.5 mm, gradually smaller toward stem apex, densely pubescent, margin densely ciliolate, apex rounded, midvein distinct; lower

leaves widely spaced, shorter than internodes, blades spatulate or obovate; upper leaves crowded, blades elliptic. Flowers many, subsessile. Calyx narrowly obconic, 7–8 mm long, outside pubescent; lobes narrowly triangular, 3–3.5 mm long, nearly as long as tube, equal, margin membranous and densely ciliolate, apex acute, midvein prominent. Corolla scarcely exceeding calyx, pale yellow, tubular, 8–9 mm long; lobes ovate, 1.5–2 mm long, margin entire, apex obtuse; plicae ovate, 0.8–1 mm long, margin entire to crenulate, apex obtuse. Stamens inserted at middle of corolla tube, equal, filaments 1.2–1.5 mm long, anthers 0.4–0.6 mm long. Style 1–1.2 mm long; stigma lobes linear. Gynophore to 5 mm long, stout. Capsules spatulate to obovate, 4–4.5 mm long, conspicuously winged; wing strong and broad at apex, narrowed toward base. Seed brown, oblong or ovoid, 0.7–1 mm long, minutely reticulate.

Gentiana kunmingensis resembles *G. maeulchanensis* of section *Chondrophyllae* but differs in having pubescent leaves and calyx, a pale yellow corolla that is scarcely exserted from the calyx, and equal stamens.

Gentiana myrioclada Franchet var. **wuxiensis** T. N. Ho & S. W. Liu, var. nov. TYPE: China. Sichuan: Wuxi, on hillside, Aug. 1958, *G. H. Young 59446* (holotype, IBSC).

A var. *myrioclada* foliis lobisque calycis dense hispidulis differt.

Plants of this variety are distinguished from those of variety *myrioclada* by being densely hispidulous, especially on the leaves and calyx lobes.

Gentiana xingrenensis T. N. Ho, sp. nov. TYPE: China. Guizhou: Xingren, among shrubs, 1,300 m, Aug. 1972, *C. G. Den s.n.* (holotype, GMI—Herbarium, Guizhou Institute of Chinese Traditional Medicine, Guiyuan, Guizhou).

Inter species *Chondrophyllarum* habitu *Gentianae pedatae* Harry Smith et *G. scyphyllae* T. N. Ho similis, a quibus foliis inferioribus oblongis, orbicularibus usque obovatis, superioribus lineari-lanceolatis usque linearibus, corolla extra luteo-viridi, intra pallide caerulea, calycem vix superanti differt.

Annuals 3–4 cm tall. Stems erect, lower half simple and leafless; upper half much-branched, with short internodes, apically many-leaved, flowering branches crowded into a capitulum. Lower leaves with connate sheathing bases 0.5–1 mm long; blade oblong, orbicular, to obovate, 1.4–2 × 0.8–1.6 cm, base narrowed, margin cartilaginous, apex obtuse to rounded and cuspidate with a recurved tip, midvein distinct. Upper cauline leaves with connate sheathing bases 1–1.5 mm long; blade linear-lanceolate to linear, 5–7 × 1–2.5 mm, base obtuse, margin cartilaginous and ciliolate, apex acuminate and awned, midvein distinct. Flowers many, subsessile. Calyx tubular, 6–7 mm long; lobes subulate, 2.5–3 mm long, margin cartilaginous and ciliolate, apex acuminate and awned, midvein prominent. Corolla pale yellow-green outside, pale blue inside, tubular, 8–10 mm long; lobes ovate, 1–1.5 mm long, margin entire, apex obtuse; plicae ovate, 0.5–0.8 mm long, margin denticulate, apex obtuse. Stamens inserted on lower part of corolla tube, equal, filaments 2–2.5 mm; anthers 0.8–1 mm. Ovary oblong, 2–2.5 mm long; style 0.8–1 mm long; stigma lobes oblong. Gynophore ca. 2 mm long, stout. Capsules obovoid, ca. 3 mm long, conspicuously winged; wing strong and broad at apex, narrowed toward base. Seed coat minutely reticulate.

Within section *Chondrophyllae*, *Gentiana xingrenensis* resembles *G. pedata* and *G. scyphylla*, but differs from both by having oblong, orbicular, or obovate lower leaves and linear-lanceolate to linear upper leaves, and corollas scarcely exserted from the calyx and pale yellow-green outside and pale blue inside.

Gentiana cephalantha Franchet ex Forbes & Hemsley var. **vaniotii** (Léveillé) T. N. Ho, comb. et stat. nov. Basionym: *Gentiana vaniotii* Léveillé, Repert. Sp. Nov. Regni Veg. 12: 182. 1913. TYPE: China. Yunnan: Yunnansen (Kunming), 8 Nov. 1896, *Bodinier 31* (lectotype, selected here, E).

Gentianodes vaniotii (Léveillé) A. & D. Löve, Bot. Not. 125: 258. 1972.

This variety is very common around Kunming, Yunnan. It is distinguished from variety *cephalantha* by having numerous glandular hairs toward the stem apex. The syntypes of *G. vaniotii* belong to different taxa. One, *Bodinier 31*, corresponds well to the original description and hence is placed here. Another, *Esquirol 701*, is *G. rigescens* Franchet ex Forbes & Hemsley.

Gentiana davidii Franchet var. **fukienensis** (Ling) T. N. Ho, comb. et stat. nov. Basionym: *Gentiana fukienensis* Ling, Contr. Inst. Bot. Nat. Acad. Peiping 6(4): 217. 1949. TYPE: China. Fujian (as Fukin): Shanghan, Chutsaotung, southern slope, 1,350–1,500 m, 20 Oct. 1945, *Y. Ling 4604* (holotype, PE).

Gentiana davidii var. *fukienensis* differs from variety *davidii* in being a smaller plant (2.5–4 cm tall) with truncate corolla plicae. It is restricted to Fujian and Taiwan.

Gentiana lawrencei Burkill var. **farreri** (I. B. Balfour) T. N. Ho, comb. et stat. nov. Basionym: *Gentiana farreri* I. B. Balfour, Trans. & Proc. Bot. Soc. Edinburgh 27: 248. 1918. TYPE: cultivated plant collected 27 Oct. 1916 grown from seed collected in China. Gansu: Jo-Ni alps, *Farrer & Purdom s.n.*, 1914 (lectotype, selected here, E).

The actual description by Balfour was based on living plants, and the type cover for this species in the cultivated section at E contains two sheets (M. Watson, pers. comm.). Both these sheets were apparently made from the cultivated plants that were the basis of Balfour's description. One specimen, collected in September 1916, contains just a dissected calyx and corolla, and the other specimen, collected 27 October 1916, contains eight flowers and several plants. The labels on both the September 1916 and the 27 October 1927 specimens appear to be in Balfour's hand, but there is no indication on these sheets as to which Balfour considered to be the holotype. Because no holotype was designated, the 27 October 1927 specimen is being designated as the lectotype.

Gentiana lawrencei is a very common species native to the Qinghai-Xizang Plateau of China. Within this species there are two recognizable varieties. *Gentiana lawrencei* var. *lawrencei* has calyx lobes about as long as the calyx tube, and *Gentiana lawrencei* var. *farreri* has calyx lobes at least 1.8 times as long as the calyx tube.

Gentiana ninglangensis T. N. Ho var. **glabrescens** (Harry Smith) T. N. Ho, comb. nov. Basionym: *Gentiana pubigera* var. *glabrescens* Harry Smith in Handel-Mazzetti, Symbolae Sinicae 7: 961. 1936. TYPE: China. Sichuan: Yenyuan-Yalung, 27°31′N, 2,400–3,300 m, 12 May 1914, *Handel-Mazzetti 2206* (holotype, UPS).

On the basis of its having elliptic to linear-lanceolate leaves toward the stem apex, variety *glabrescens* is better placed in *Gentiana ninglangensis* than in *G. pubigera*. The type locality of variety *ninglangensis* is in Ninglang Hsien, northern Yunnan, and is very close to that of variety *glabrescens*.

Gentiana prostrata Haenke var. **ludlowii** (Marquand) T. N. Ho, comb. et stat. nov. Basionym: *Gentiana ludlowii* Marquand, Bull. Misc. Inform. Kew 1937: 189. 1937. TYPE: China. Xizang: Lhakang, shady rocky hillside, 3,900 m, 1 Sep. 1933, *Ludlow & Sherriff 507* (holotype, BM).

This variety, which is restricted to Xizang and Qinghai provinces, differs from variety *prostrata* by having papillate stems and leaf margins and calyces usually half as long as the corolla.

Gentiana pulvinarum W. W. Smith subsp. **subtilis** (Harry Smith) T. N. Ho, comb. et stat. nov. Basionym: *Gentiana subtilis* Harry Smith, Anz. Wiss. Wien, Math.-Nat. 63: 103. 1926. TYPE: China. NW Yunnan: Mekong-Salwin divide, Sila, 26 Aug. 1916, *Handel-Mazzetti 9941* (holotype, K; isotypes, E, UPS, US).

Subspecies *subtilis*, which is endemic to northwestern Yunnan, is readily distinguished from subspecies *pulvinarum* by its spatulate or elliptic leaves and elliptic calyx lobes. The latter has linear leaves and calyx lobes and is distributed in China (Yunnan), India, and Nepal. The width of leaves and calyx lobes appears to narrow from the eastern part of the species range to the west, and it is better to treat the two entities as subspecies than as independent species.

Gentiana stipitata Edgeworth subsp. **tizuensis** (Franchet) T. N. Ho, comb. et stat. nov. Basionym: *Gentiana tizuensis* Franchet, Bull. Soc. Bot. France 43: 494. 1896. TYPE: China. Sichuan: Da-tsien-lou (Kangding), Tizou and Tongolo, Sep.–Oct. 1891, *Soulie 368* (holotype, P; isotype, K).

Gentianodes tizuensis (Franchet) A. & D. Löve, Bot. Not. 125: 257. 1972.

Smith (1961) distinguished *Gentiana tizuensis* from *G. stipitata* primarily on the basis of having 4-merous rather than 5-merous flowers. The examination of types and other gatherings of both taxa reveals that this character is unreliable and that the two are basically very similar in all respects except the corolla. *Gentiana stipitata* has corollas 2.5–3 cm long and distinctly awned corolla lobes and is distributed in northwestern India and Nepal, whereas *G. tizuensis* has corollas (2.5–)3–4 cm long and indistinctly awned corolla lobes and is distributed in western China. The two are better treated as subspecies.

Gentiana suborbisepala Marquand var. **kialensis** (Marquand) T. N. Ho, comb. nov. Basionym: *Gentiana yunnanensis* var. *kialensis* Marquand, Bull. Misc. Inform. Kew 1937: 166. 1937. TYPE: China. W Sichuan: [Kangding], Tongolo, Kiala, 1893, *Soulie 680* (lectotype, selected here, K; isolectotype, P).

Gentiana blinii Léveillé, Bull. Geogr. Bot. 25: 22. 1915. TYPE: China. Yunnan: Lou-pou, 3,000 m, Oct. 1912, *E. E. Maire s.n.* (holotype, E).

On the basis of its having uniform suborbicular calyx lobes, variety *kialensis* is more at home in *Gentiana suborbisepala* than in *G. yunnanensis*. The variety differs from variety *suborbisepala* by having corollas less than 1.5(–2) cm long. It is distributed in northeastern Yunnan, southwestern and western Sichuan, and Guizhou.

Gentiana trichotoma Kusnezow var. **chingii** (Marquand) T. N. Ho, comb. et stat. nov. Basionym: *Gentiana chingii* Marquand, Bull. Misc. Inform. Kew 1931: 83. 1931. TYPE: China. Gansu (as Kansu): Ye Cheon K'ou, near old Taochow [Lintao Xian] on the border of Tibet [Qinghai], in dense tussocks, 3,300–3,800 m, 21 Aug. 1923, *R. C. Ching 817* (holotype, K; isotype, N).

This variety differs from variety *trichotoma* by having linear basal leaves and 1–3-flowered inflorescences. It is distributed in Gansu, Qinghai, and Xizang.

Gentiana wardii W. W. Smith var. **emergens** (Marquand) T. N. Ho, comb. et stat. nov. Basionym: *Gentiana emergens* Marquand, Bull. Misc. Inform. Kew 1931: 82. 1931. TYPE: China. SW Sichuan: Muli, Mt. Mitzuga, on rocks and boulders, 3,050–4,875 m, June 1928, *Rock 16591* (holotype, E; isotypes, A, K, NY, UPS).

This variety differs from variety *wardii* by having large corollas 3–3.5 cm long and triangular plicae 2–2.5 mm long.

Swertia luquanensis S. W. Liu, sp. nov. TYPE: China. NE Yunnan: Luquan, hillsides, 2,450 m, 28 Oct. 1965, *Hu Yue-ying 652338* (holotype, GMI).

Speciei *Swertiae patenti* Burkill similis, sed foliis basilaribus lineare-oblongis, calycis lobis 2–3 mm latis, lanceolatis, non bracteaceis distinguenda.

Perennials 5–6(–18) cm tall. Roots stout, 3–4 mm diam., fibrous. Stems procumbent to ascending, caespitose, subquadrangular, narrowly winged, papillate on angles, simple. Leaves mostly basal, crowded in a rosette, short petiolate; blade linear-oblong, 2–6 × 0.2–0.3 cm, base narrowed, apex acute, midvein distinct; cauline leaves sessile, linear, to 3 × 0.2 cm, base narrowed, apex acuminate, midvein distinct. Inflorescences racemelike, few-flowered; flowers 4-merous, ca. 1.5 cm diam. Pedicel erect, 7–12 mm, slender. Calyx longer than corolla; lobes not bractlike, lanceolate, 8–11 × 2–3 mm, unequal, obtuse at both ends, margin scabrous and slightly revolute, veins 3 and indistinct. Corolla pale yellow, tube 1–2 mm; lobes ovate, apex acute; nectaries 2 per corolla lobe, pocket-shaped, with a triangular scale and many short fimbriae. Filaments ca. 5 mm long; anthers blue, oblong, ca. 1.5 mm long. Ovary ovoid-ellipsoid, 8–10 mm long; style short, distinct; stigma lobes capitate. Capsules ovoid, ca. 8 mm long. Seeds brown, subglobose, smooth.

Swertia wardii Marquand var. **rigida** (T. N. Ho & S. W. Liu) T. N. Ho, comb. nov. Basionym: *Swertia phragmitiphylla* var. *rigida* T. N. Ho & S. W. Liu, Acta Phytotax. Sin. 18: 79. 1980. TYPE: China. Xizang: Yadong Xian, 20 Sep. 1974, *Qinghai-Xizang Exped. 74-2716* (holotype, PE).

Swertia wardii var. *rigida* has racemelike inflorescences with pedicels that are erect, rigid, and elongating to 10 cm in fruit. This variety differs from *S. wardii* var. *wardii* (syn. *S. phragmitiphylla* T. N. Ho & S. W. Liu var. *phragmitiphylla*), which has paniculate inflorescences with pedicels that are spreading to somewhat arcuate, not rigid, and elongating to only 7.5 cm in fruit. Both varieties are endemic to Xizang, China.

Acknowledgments. We are most grateful to the directors and staff of the herbaria at BM, GMI, K, P, and PE for the loans and permission to consult their collections. We are much indebted to Bruce Bartholomew and Michael Gilbert for useful discussions and help in the preparation of this manuscript, and to Ihsan Al-Shehbaz for editing the manuscript.

Literature Cited

Smith, H. 1961. Problems relating to the *Gentiana cachemirica* of the "Flora of British India." Kew Bull. 15: 43–55.

New Species of *Cyclanthera* (Cucurbitaceae) from Mexico and Central America

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ABSTRACT. Five new species of *Cyclanthera* are here described: *C. cogniauxii* from the Central Cordillera of Costa Rica; *C. dieterleana* from Durango, Mexico; *C. dioscoreoides* with a disjunct distribution in México, Mexico, and Suchitepéquez, Guatemala; *C. entata* from Chiapas, Mexico; and *C. heiseri* from Durango, Sinaloa, and Jalisco in Mexico.

Cyclanthera Schrader, a distinctive genus of New World cucurbits in the tribe Cyclanthereae, can be easily recognized either by its single, unfolded horizontal ringlike theca or by its oblique, explosively dehiscent capsular fruits. At dehiscence, the seeds are thrown by a catapult-like placental arm. Similar explosively dehiscent fruits are found in the closely related *Elateriopsis* Ernst, *Hanburia* Seemann, *Pseudocyclanthera* Martinez Crovetto, and *Rytidostylis* Hooker & Arnott. *Cyclanthera* is a moderate-sized genus as far as the Cucurbitaceae is concerned, including 35–40 species of small annual herbaceous vines. Study of collections in the course of preparing a monograph of the genus has brought to light five new species from Mexico, Guatemala, and Costa Rica, which are here described.

Cyclanthera cogniauxii C. E. Jones & Kearns, sp. nov. TYPE: Costa Rica. Cartago: 12 km S of Tapantí, beside bridge over Río Grande de Orosí, 6 Apr. 1969, 1,500 m, *Lent 1573* (holotype, F 1703275). Figure 1.

Folia plus minusve 5–7 lobata; glandulae ad basim folii laminae 2–6 parvulae; inflorescentiae masculae folia superantes; pedunculus communis masculus inventus solum ad superum ⅓ florifer; corolla virella.

Stem nodes pubescent to tomentose. Petioles glabrous to puberulent, 10–30 mm long. Leaves broadly ovate to orbicular, somewhat 5- or 7-lobed, 4–12 × 5–12 cm, the central lobe triangular, 2–5 × 3–7 cm, lateral lobes similar, becoming progressively smaller, the margins denticulate to coarsely dentate; upper surface glabrous, with veins glabrous to puberulent especially at juncture of petiole and base of leaf; lower surface completely glabrous; glands at base of leaf blade 2–6, very small. Tendrils bifid. Male inflorescences elongated, few-flowered, racemes or panicles, 6–16 cm long, often longer than the leaves, with flowers confined to upper ⅓ of peduncle or less; pedicels glabrous to puberulent, 2–5 mm long; calyx tube 4–4.5 mm wide; calyx teeth 5, very small to 1 mm long; corolla greenish white, 7–10 mm wide; petals 5, 3-nerved, 2–3 × 2–3 mm; anther capitulum 2–3 mm wide; column 2–2.25 mm long; pollen pentacolporate, 75–80 μm diam. Peduncles of female flowers 6–10 mm long; style 1.5–2 mm long; stigma 1.5–2 mm wide; ovary lanceolate to ovate, 3–4 × 2–2.5 mm, the apex acuminate, with beak 1.5–2 mm; ovules 3–5. Fruiting peduncles 2.5–7 cm; fruit 15–20 × 10–15 mm, the apex blunt; setae many, over entire fruit, 1–6 mm long; placenta 5–7 mm long. Seeds 7–8 × 4–5 × 1–1.5 mm.

Cyclanthera cogniauxii is found in Costa Rica along the Central Cordillera at elevations between 1,500 and 2,500 m. It is quite distinct and appears to be only distantly related to *C. steyermarkii* Standley and *C. monticola* Gentry. It can be readily separated from the former by the presence of glands at the base of the leaf blade and by the position of the male flowers along the male inflorescence. It can be separated from the latter by the much longer male inflorescence, much larger male flowers, and by the presence of glands at the base of the leaf blade. *Cyclanthera cogniauxii* is named for the eminent nineteenth-century authority on the family Cucurbitaceae and former monographer of the genus *Cyclanthera*, Celestin Alfred Cogniaux (1877).

Paratypes. COSTA RICA. **Alajuela:** "La Palma" de San Ramón, 21–23 Aug. 1927, *Brenes 5691* (F); between Finca La Selva y San Rafael de Vara Blanca, N slope Barva, 1,740 m, 23 June 1963, *Jiménez 834* (F);

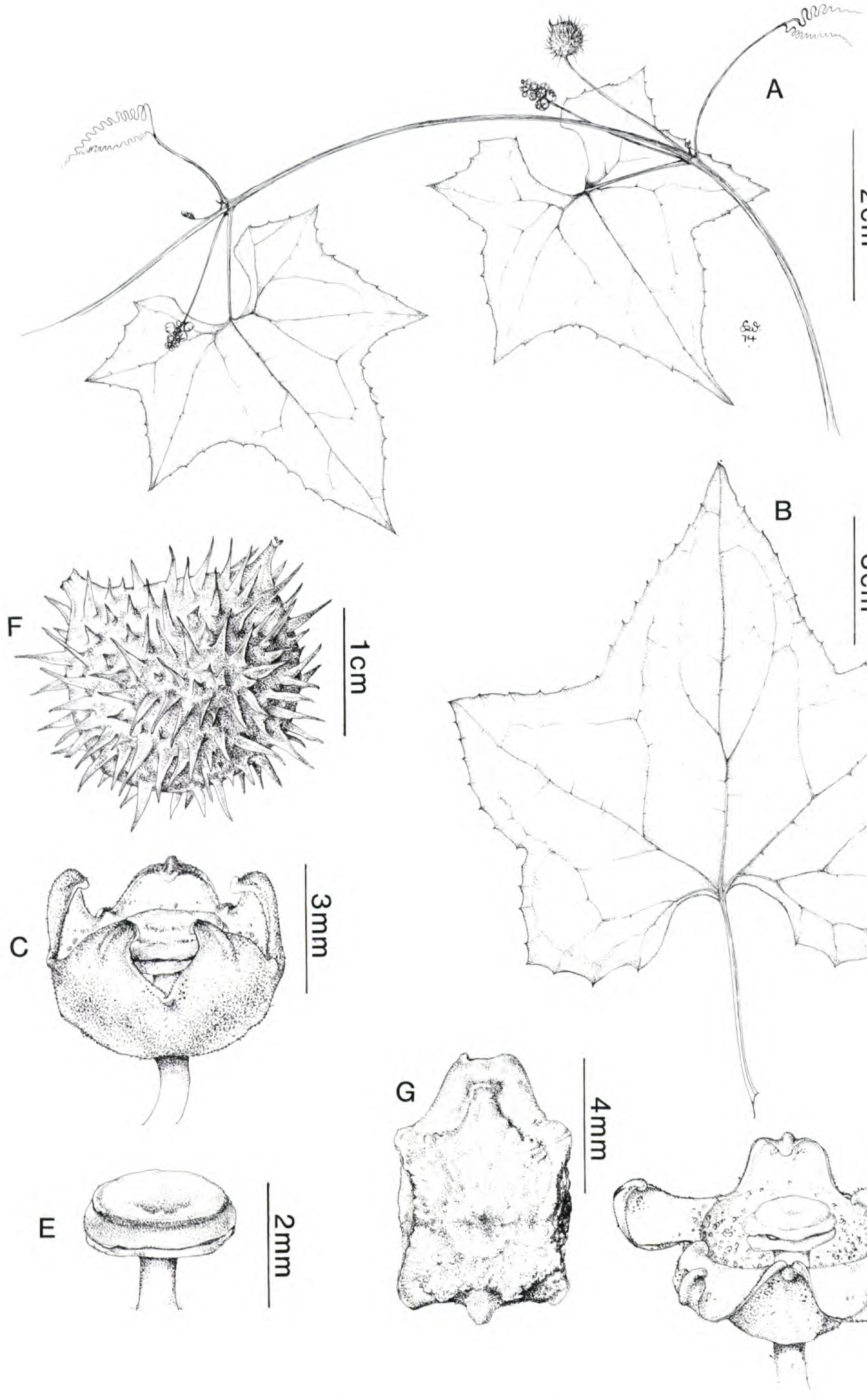

Figure 1. *Cyclanthera cogniauxii* C. E. Jones & Kearns. —A. Habit. —B. Leaf. —C. Male flower, slightly opened. —D. Male flower with petals pulled open. —E. Androecium. —F. Fruit. —G. Seed. Drawn from *Brenes 5691* (B), *Lent 558* (A), *Lent 1573* (F, G), *Williams et al. 28154* (C, D, E).

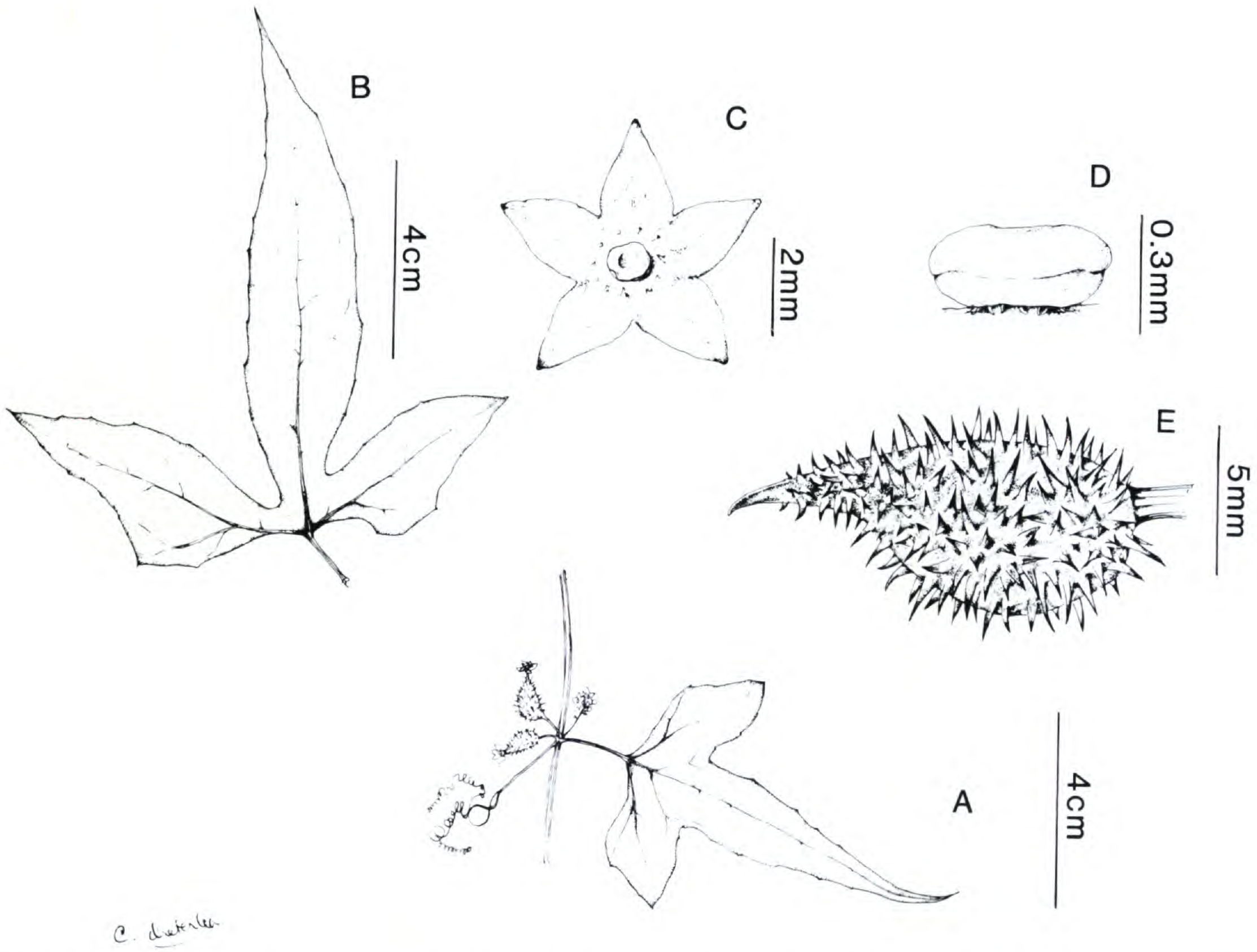

Figure 2. *Cyclanthera dieterleana* C. E. Jones & Kearns. —A. Habit. —B. Leaf. —C. Male flower. —D. Androecium. —E. Fruit. Drawn from *Dieterle 3826*.

Zarcero, La Briss de Zarcero, 2,300 m, 4 Mar. 1938, *Smith H-386* (F); Viento Fresco, 1,600–1,900 m, 13 Feb. 1926, *Standley & Torres R. 47860* (US). **Cartago:** 2 km NW of Trinidad on road up Volcán Turrialba, 1,900 m, 1 May 1965, *Lent 558* (F); La Estrella, 26–27 Mar. 1924, *Standley 39351* (US); La Sierra, ca. 25 km S of Cartago, Cordillera de Talamanca, 2,000 m, 23 Jan. 1965, *L. O. Williams et al. 28154* (F); Vara Blanca de Sarapiquí, N slope of Central Cordillera, 1,500–1,700 m, July–Sep. 1937, *Skutch 3258* (GH, K, MO); S of Vara Blanca on road to San Miguel, 1,900 m, 2 July 1985, *Hammel & Grayum 14098* (MO); Los Cartagos, 2,200 m, 16 Apr. 1963, *Skutch 5480* (F). **San José:** near Río Cascajal, Las Nubes, Coronado, 1,525 m, 10 Apr. 1963, *Jiménez 617* (F); between La Estrella and Copey Hasta, 2,450 m, 15 Feb. 1935, *Valerio 1167* (F).

Cyclanthera dieterleana C. E. Jones & Kearns, sp. nov. TYPE: Mexico. Durango: ca. 45 km SW from La Ciudad, along the main highway between Torreón and Mazatlán, 2,250 m, 21–22 Oct. 1971, *Dieterle 3826* (holotype, MICH). Figure 2.

Folia profunde vel non profunde 3-lobata; glans ad basim folii laminae nulla; inflorescentiae masculae folia breviores; pedunculus communis masculus usque ad basim florifer; corolla flavo-virens.

Stem nodes puberulent. Petioles glabrous, 3–20 mm long. Leaves broadly triangular to ovate, shallowly or deeply 3-lobed, 4–11 × 2.5–11 cm; central lobe narrowly lanceolate, 3–9 × 6–25 mm; lateral lobes similar, somewhat secondarily lobed, 0.7–6 × 5–25 mm; margins sparingly denticulate; upper surface glabrous, with veins glabrous to puberulent especially at juncture of petiole and base of leaf blade; lower surface completely glabrous; glands at base of leaf blade none. Tendrils bifid. Male inflorescences very short, few-flowered racemes, 4–10 mm long, shorter than the petiole, flowering to base of peduncle; pedicels glabrous, 1–3 mm long; calyx tube 0.75 mm wide; calyx teeth none; corolla greenish yellow, 2.5–3.5 mm wide; petals 5, 1- to slightly 3-nerved, 0.5–1.25 × 0.5–1 mm; anther capitulum 0.5 mm wide, sessile; pollen tetracolporate, 55–63 μm diam. Peduncles of female flowers 1–2 mm long; stigma 0.75–1 mm wide, sessile; ovary lanceolate to ovate, 2–2.5 × 1–1.5 mm, the apex acuminate, with beak 1–1.5 mm; ovules 3–4. Fruiting pedun-

cles 4–7 mm; fruit 10–15 × 6–7 mm, the apex acuminate, with beak 1–1.5 mm; setae many, over entire fruit, 1–3 mm long; placenta 7–8 mm long. Seeds 5.5–6 × 3.5–4 × 1–1.5 mm.

Known only from two collections from the states of Durango and Chihuahua, Mexico, at 1,800–2,250 m. *Cyclanthera dieterleana* appears to be related to *C. rostrata* (P. G. Wilson) Kearns & C. E. Jones and *C. heiseri*, from which it is readily separated by having shallowly or deeply 3-lobed leaves instead of 3 primary leaflets. *Cyclanthera dieterleana* also seems to be closely related to *C. dioscoreoides*, from which it is easily separated by the position of the male flowers along the peduncle of the inflorescence, the length of the male inflorescence, and the shallowly or deeply 3-lobed versus nonlobed leaves. This species is named in honor of Jennie Van Akkeren Dieterle, the collector of the type, a specialist in New World Cucurbitaceae and author of the family for the *Flora of Guatemala* (Dieterle, 1976).

Paratype. MEXICO. **Chihuahua:** Municipio Ocampo, Parque Nacional de Cascada Basaseachi, in canyon along Río Candamena leading to falls, 1,800 m, 16 Oct. 1986, *Spellenberg et al. 8772* (NMC, TEX).

Cyclanthera dioscoreoides C. E. Jones & Kearns, sp. nov. TYPE: Mexico. México: ca. 8 km NE of San Bartolo along road between Toluca and Valle de Bravo, deep moist gorge of a creek, ca. 2,600 m, 20 Nov. 1971, *Dieterle 4200* (holotype, MICH). Figure 3.

Folia ovata ad triangularia; glans ad basim folii laminae nulla; inflorescentiae masculae petioli superantes; pedunculus communis masculus inventus solum ad superum ½ florifer; corolla nivea.

Stem nodes glabrous to puberulent. Petioles glabrous, 1–20 mm long. Leaves ovate to triangular, not lobed, 1–5.5 × 1–5.5 cm, the margins denticulate; upper surface glabrous, the veins glabrous to somewhat puberulent at juncture of petiole and base of leaf blade; lower surface completely glabrous; glands at base of leaf blade none. Tendrils simple or bifid. Male inflorescences of short to elongate, few-flowered racemes or panicles, 1–5 cm long, longer than the petioles, with flowers confined to upper ½ of peduncle or less; pedicels glabrous, 0.5–3 mm long; calyx tube 1 mm wide; calyx teeth none; corolla whitish, 2.5–3 mm wide; petals 5, 1-nerved, 0.75–1 × 0.75–1 mm; anther capitulum 0.25–0.5 mm wide, nearly sessile to column of 0.25 mm; pollen tetra- or pentacolporate, 50–55 μm diam. Peduncles of female flowers 0.5–1.5 mm long; style nearly sessile to 0.25 mm long; stigma 0.5–0.75 mm wide; ovary lanceolate, 1.5–2 × 1–1.5 mm, the apex long acuminate, with beak 1–2 mm; ovules 3–4. Fruit 5–7 × 2 mm; apex long acuminate, with beak 4–5 mm; setae few, primarily confined to adaxial surface, 0.1–0.25 mm long; placenta 0.5–1 mm long. Seeds 3–4 × 3–3.5 × 0.5 mm.

Cyclanthera dioscoreoides is known only from two collections: one from Mexico at 2,600 m and the other from Guatemala at 1,200–1,300 m. The two widely separated populations may represent distinct subspecies, but a clear understanding will only be possible with access to additional specimens. The species appears to be most closely related to *C. dieterleana*, under which see discussion. The specific epithet refers to the superficial resemblance of the plant to some species of the genus *Dioscorea* L.

Paratypes. GUATEMALA. **Suchitepéquez:** SW lower slopes of Volcán Zunil along Río Samalá, in vicinity of Finca Montecristo, SE of Santa María de Jesús, 1,200–1,300 m, 31 Jan. 1940, *Steyermark 35196* (F, US).

Cyclanthera entata C. E. Jones & Kearns, sp. nov. TYPE: Mexico. Chiapas: Mpio. of San Cristóbal de Las Casas, ca. 9 mi. SE of San Cristóbal de Las Casas, SW of hwy. 190 near Rancho Nuevo, 9,000 ft., 20 Aug. 1966, *Breedlove 15135* (holotype, CAS; isotypes, K, F specimen not located). Figure 4.

Folia vadose 3-lobata; glans ad basim folii laminae nulla; inflorescentiae masculae petioli superantes; pedunculus communis masculus inventus solum ad superum ⅓ florifer; corolla alba.

Stem nodes puberulent. Petioles glabrous, 3.7–6 cm long. Leaves broadly ovate, very shallowly 3–5-angled, the blade 5–6 × 5–6.5 cm, the margins finely denticulate; upper surface glabrous; lower surface nearly glabrous, with scattered papillae (< 0.2 mm long) and slightly puberulent at junction of leaf veins and petiole; glands at base of leaf blade none. Tendrils bifid. Male inflorescences of short racemes, occasionally compound with some few-flowered branches below, 2–6 cm long, longer than the petioles, with flowers restricted to upper ⅓ of peduncle; peduncles glabrous, 35–50 mm; calyx tube 0.8 mm wide; calyx teeth < 0.1 mm; corolla white, 1–1.5 mm wide; petals 5, 1-nerved, 0.8 × 0.6 mm; anther capitulum ca. 0.3 mm wide, sessile; pollen characters uncertain. Peduncles of female flowers essentially sessile; stigma and style measurements uncertain; ovary elliptic to lanceolate, 1–1.6 × 0.8 mm, the apex attenuate, with beak 1–1.6 mm; ovules 1. Fruiting peduncles elongating during maturation to 25–37 mm; fruit 6 × 5–6 mm, the apex acuminate, with beak 2.4–3.2 mm; setae few, primarily

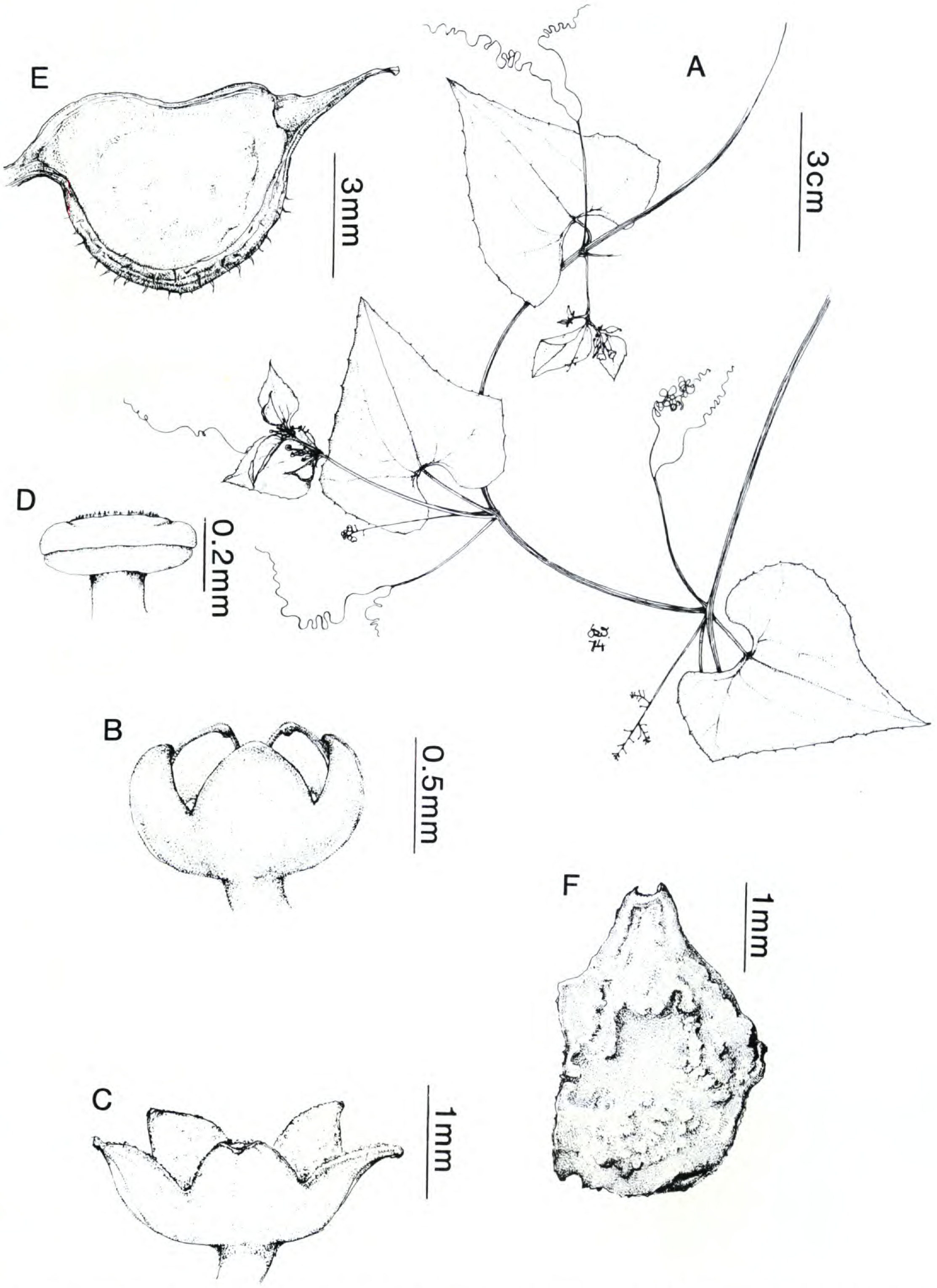

Figure 3. *Cyclanthera dioscoreoides* C. E. Jones & Kearns. —A. Habit. —B. Male flower bud, slightly open. —C. Male flower, open. —D. Androecium. —E. Fruit. —F. Seed. Drawn from *Dieterle 4200*.

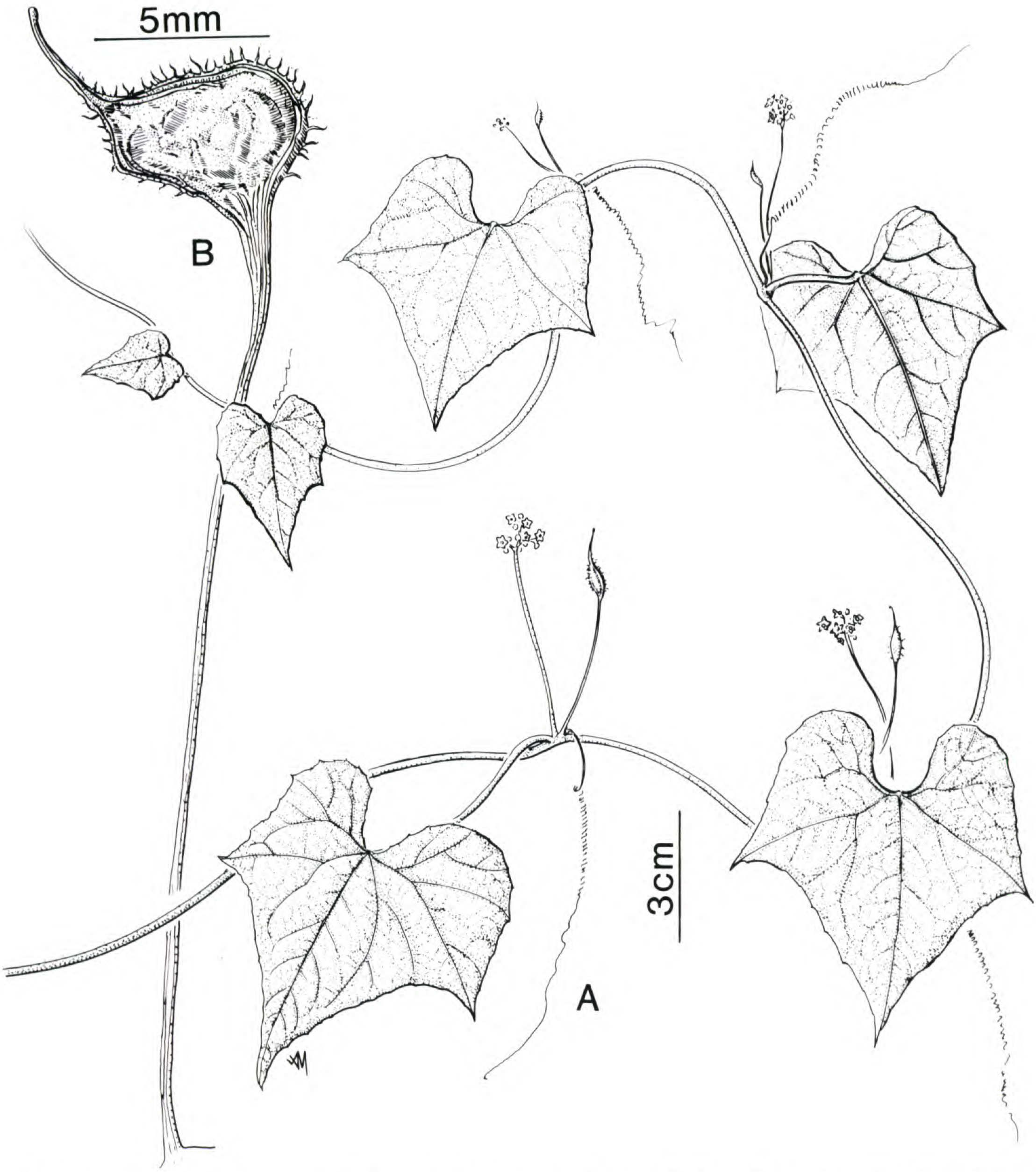

Figure 4. *Cyclanthera entata* C. E. Jones & Kearns. —A. Habit. —B. Fruit. Drawn from *Breedlove 15135*.

confined to adaxial surface, 0.3–0.6 mm; placenta length uncertain. Seeds 5.5 × 3.5 × 1 mm.

Cyclanthera entata is similar to *C. rostrata*, but the two species can be easily differentiated. The leaves of *C. entata* are simple with shallow lobes in contrast to the trifoliolate leaves of *C. rostrata*. In addition, the fruits tend to be more square in *C. rostrata*, while those of *C. entata* have more setae on the margins. The specific epithet refers to the post-anthesis expansion of the petiole, a character also found in some other species of *Cyclanthera*. *Cyclanthera entata* is *Cremastopus* P. Wilson sp. 3 of Jeffrey (1978; Kearns & Jones, 1992) and known only from the type collection.

Cyclanthera heiseri C. E. Jones & Kearns, sp. nov. TYPE: Mexico. Durango: ca. 45 km SW from La Ciudad, along the main highway between Torreón and Matzatlán, seepage area on rock face along road, ca. 2,250 m, 21–22 Oct. 1971, *Dieterle 3825* (holotype, MICH). Figure 5.

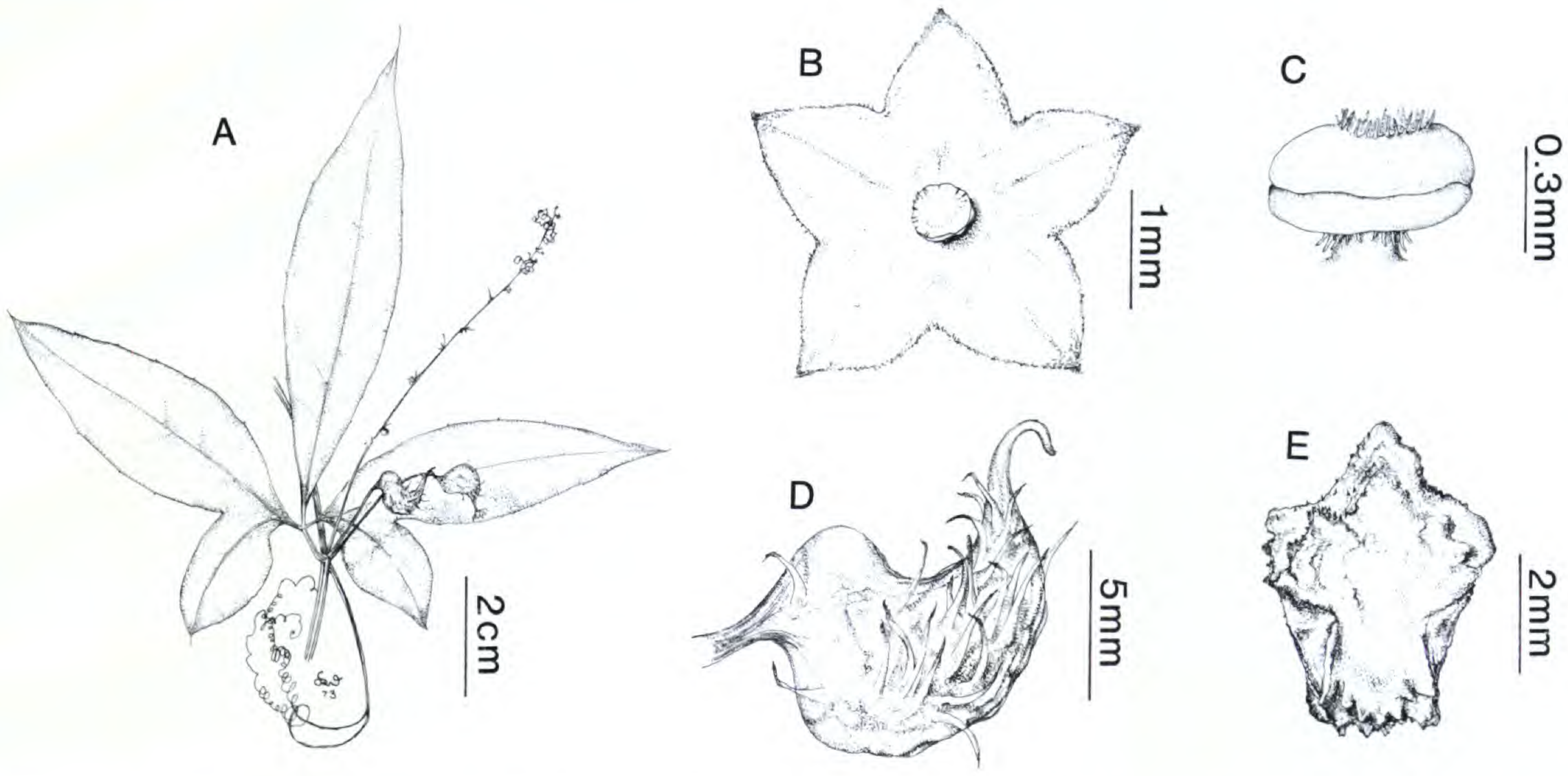

Figure 5. *Cyclanthera heiseri* C. E. Jones & Kearns. —A. Habit. —B. Male flower. —C. Androecium. —D. Fruit. —E. Seed. Drawn from *Dieterle 3825*.

Folia trifoliolata; glans ad basim folii laminae nulla; inflorescentiae masculae petioli superantes; pedunculus communis prope ad basim florifer; corolla virella.

Stem nodes puberulent. Petioles glabrous, 5–45 mm long. Leaves broadly ovate to orbicular, trifoliolate, 1.5–9 × 1.5–9 cm; central leaflet elliptical, 1–7.5 × 0.3–2 cm; blade of lateral leaflets similar, ± bi- or trisect, 1–6 × 0.3–2 cm, the segments of each lateral leaflet becoming progressively smaller, the margins denticulate; upper surface glabrous, the veins puberulent, especially at juncture of leaflets; lower surface completely glabrous; glands at base of leaf blade none. Tendrils bifid. Male inflorescences of elongate, few-flowered racemes or panicles, 1–8 cm long, flowering nearly to base of peduncle; pedicels glabrous, 0.5–3 mm long; calyx tube 0.5–1 mm wide; calyx teeth none; corolla greenish white, 1.5–4 mm wide; petals 5, 1- to slightly 3-nerved, 0.5–1.25 × 0.25–1.5 mm; anther capitulum 0.5–0.75 mm wide; column nearly sessile to 0.25 mm long; pollen tetracolporate, 49–52 μm diam. Peduncles of female flowers 1–3 mm long; style 0.1–0.25 mm long; stigma 0.75–1 mm wide; ovary lanceolate, 2–3 × 1–2 mm, the apex long acuminate, with beak 1.5–4 mm; ovules 2–4. Fruiting peduncles 0.2–2 cm; fruit 5–10 × 5–6 mm; apex long acuminate, with beak 5–6 mm; setae few to many over entire fruit, 0.5–3.5 mm long; placenta 3–6 mm long. Seeds 4–5 × 3.5–4 × 0.75–1 mm.

This species is known in Mexico from single collections from the states of Durango, Jalisco, and Sinaloa at elevations between 900 and 2,250 m. *Cyclanthera heiseri* appears to be most closely related to *C. rostrata* and *C. dieterleana*. Although *C. heiseri* was collected in exactly the same locality and at exactly the same time as *C. dieterleana*, it is quite distinct from the latter. *Cyclanthera heiseri* differs from *C. rostrata* by having lobed lateral leaflets and fruits with 2–4 seeds rather than 1 (rarely 2) seeds. *Cyclanthera heiseri* differs from *C. dieterleana* by having pedately trifoliolate and not simply three-lobed leaves. This species is named in honor of Charles Bixler Heiser, Jr., prominent biosystematist, ethnobotanist, writer, and cucurbit expert.

Paratypes. MEXICO. **Jalisco:** near Etzatlán, 2 Oct. 1903, *Rose & Painter 7568* (US). **Sinaloa:** 30–31 km NE of Concordia, along the main highway between Durango and Mazatlán, ca. 900 m, 22–23 Oct. 1971, *Dieterle 3844* (MICH).

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Literature Cited

Cogniaux, C. A. 1877. *Cyclanthera. In:* Diagnoses de Cucurbitacées Nouvelles et Observations sur les Es-

pèces Critiques. Mém. Couronnés Autres Mém. Acad. Roy. Sci. Belgique 28: 61–81.

Dieterle, J. V. A. 1976. Cucurbitaceae. *In:* Flora of Guatemala. Fieldiana, Bot. 24: 306–395.

Jeffrey, C. 1978. Further notes on the Cucurbitaceae: IV, some New World taxa. Kew Bull. 33: 347–380.

Kearns, D. M. & C. E. Jones. 1992. A re-evaluation of the genus *Cremastopus* (Cucurbitaceae). Madroño 39: 301–303.

Douglasia beringensis (Primulaceae): A New Species from Northwestern Alaska

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ABSTRACT. *Douglasia beringensis*, a new species from the Seward Peninsula in the Bering Strait region of Alaska, is described, illustrated, and compared to its closest arctic allies. A key is provided for the nine species of *Douglasia* recognized in North America, and a discussion of the Russian and American taxonomic concepts of the genus is given.

Douglasia beringensis S. Kelso, Jurtzev & D. F. Murray, sp. nov. TYPE: U.S.A. Alaska: Bering Land Bridge National Preserve, Seward Peninsula, Trail Creek Hills ca. 44 km SW of Deering, 65°48′37″N, 163°23′61″W, on calcite marble outcrops, 350 m, 12 July 1992, *Murray et al. 10679* (holotype, ALA; isotypes, COLO, LE, MO, US). Figure 1.

Herbae perennes caespitosae, pulvinos vel tegetes formantes. Folia superiora rosulata, erecta, varie linearia vel anguste oblonga, 5–8 mm longa, 1–1.5 mm lata, pilis stellatis et ramosis in facie superiore et inferiore, apice plus minusve revoluto. Pedunculi floriferi 1.0–10.0 mm, fructiferi usque ad 6 cm longi, pilis brevibus ramosis et stellatis tecti. Inflorescentia uniflora (rarissime biflora), involucrata; bractea plerumque 1. Calyx et bractea dense pubescens pilis stellatis et ramosis. Corolla juvenalis rosea, postea albescens, tubo 3–4 mm, limbo ca. 5 mm. Semina 1–4, castanea, quadrata vel oblongata, ca. 2 mm × 1 mm.

Herbs perennial, in loosely caespitose cushions or mats, with branched caudex and slender tap root with numerous filiform adventive roots. Stems prostrate to ascending, with imbricate, reddish, marcescent leaves below and terminal green leaf rosettes above, leaves on lower part of annual shoot usually ± remote. Leaves prominently ascending, linear to oblong, obtuse to slightly acute, 5–8 × 1–1.5 mm, densely covered with minute branched hairs on both surfaces, slightly revolute at apex, margins entire. Peduncles 1.0–10 mm in early anthesis, elongating to ca. 6 cm in fruit, densely pubescent with branched and stellate hairs throughout. Inflorescences involucrate; bract single or occasionally lacking, lanceolate to lanceolate-ovate, acute, 2–3 × 0.5–0.75 mm, pubescent with stellate hairs. Flowers 1(–2), sessile; calyces broadly campanulate, ca. 4 mm long × 3–4 mm wide, divided to middle, lobes acute to acuminate, ca. 1 mm wide, entire calyx densely pubescent with minute stellate and branched hairs; corollas salverform, constricted at the throat, tube 3–4 mm long, lobes ca. 2 × 1 mm, apex entire, limb pink, turning white in age, 5–7 mm diam. Stamens 5, included, anthers oblong, ca. 0.5 mm long. Style 1.5–2 mm long, stigma capitate. Capsule ovate, slightly shorter than calyx. Seeds 1–4, quadrate to oblong, ca. 2 mm long × 1.5 mm wide, coat chestnut brown, reticulate.

Distribution. Known from two locations 8 km apart in the north-central Seward Peninsula near the northeast edge of the Bering Land Bridge National Preserve. A third report for Conglomerate Mountain in the Kokrines Hills (64°56′N, 154°42′W) ca. 450 km east of the others is based on a poor specimen at ALA (*Miller 1602* in 1926) for which the determination is equivocal. Nevertheless, it does show the distinctive stellate pubescent calyces di-

[1]The transliteration of this surname from the Russian varies. The currently accepted spelling, and the one the author prefers, is Yurtsev; previous transliterations have adopted the spelling Jurtsev, and this was the one included by Brummit & Powell in *Authors of Plant Names* (Royal Botanic Gardens, Kew: 1992).

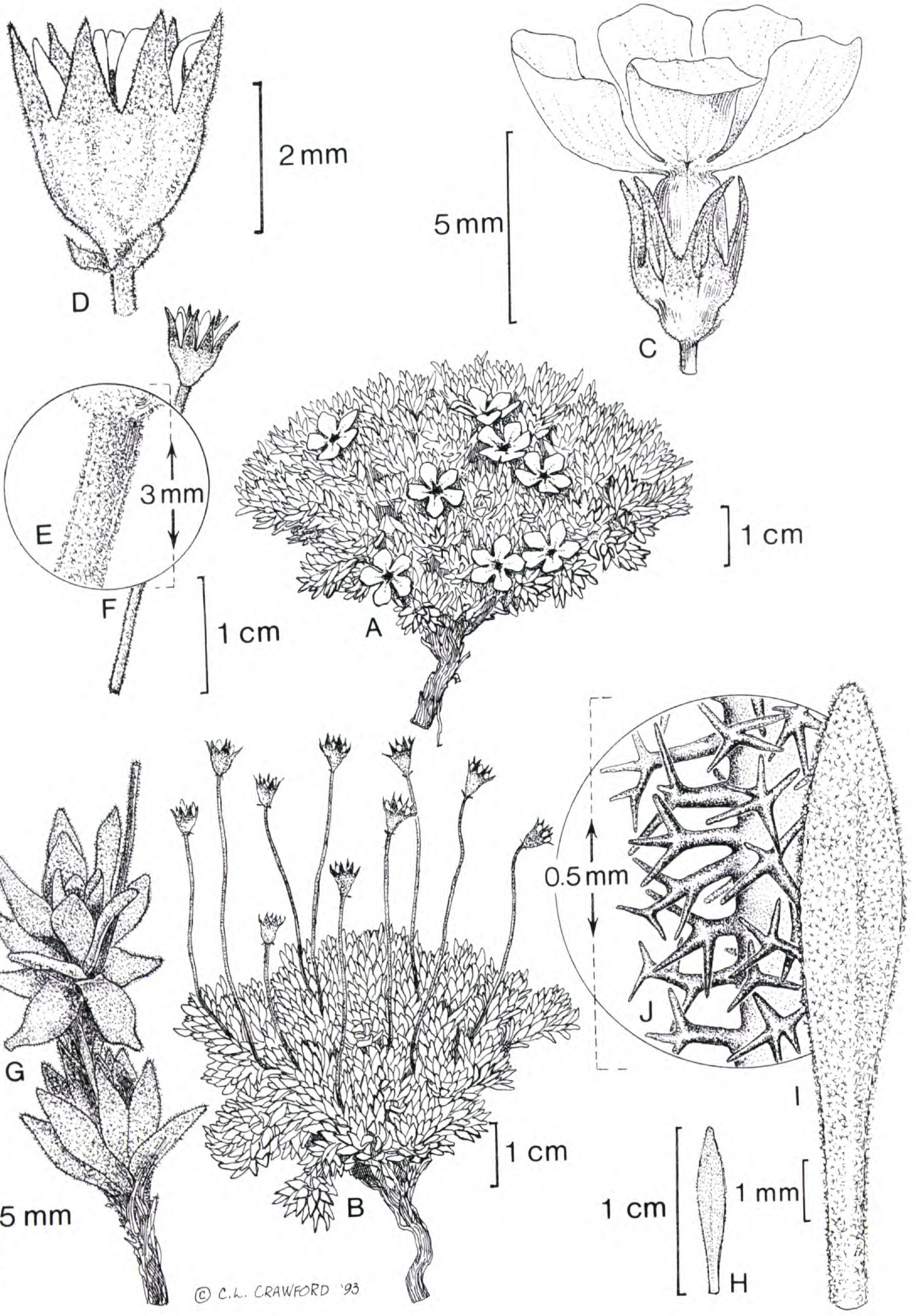

Figure 1. *Douglasia beringensis* S. Kelso, Jurtzev & D. F. Murray. —A. Plant in flower —B. Plant in fruiting stage. —C. Flower. —D. Capsule. —E, F. Pedicel with stellate pubescence. —G. Leaf rosettes. —H–J. Leaf with details of diagnostic pubescence.

agnostic for *D. beringensis*, and on that basis we report it here.

On the Seward Peninsula, *Douglasia beringensis* is locally abundant on Paleozoic marble outcrops, but it has not yet been found on other carbonate formations there. Associated species are the vascular plants *Oxytropis bryophila* (Greene) Jurtsev, *Smelowskia calycina* (Stephan ex Willdenow) C. A. Meyer var. *porsildii* Drury & Rollins, *Draba paderiana* Kjellman, *Poa glauca* M. Vahl, *Carex rupestris* Allioni, *Minuartia obtusiloba* (Rydberg) House, *Saxifraga oppositifolia* L., and fruticose lichens (det. M. Andreev) *Thamnolia subuliformis* (Ehrhart) W. Culberson, *Cetraria nivalis* (L.) Acharius, *C. tilesii* Acharius, and *Ochrolechia frigida* (Swartz) Lynge.

Paratype. U.S.A. **Alaska:** Bering Land Bridge National Preserve, Seward Peninsula, Cross Fox Butte, 65°148′14″N, 163°119′04″W, 600 m, 5 July 1993, *Murray & Kelso 11302* (ALA, LE).

The genus *Douglasia* is primarily distributed in northwestern North America from Alaska to the Northwest Territories of Canada and south through the Rocky Mountains in British Columbia, Alberta, Washington, Idaho, Montana, and Wyoming. The genus is composed of (seven to) nine species, most with restricted distributions. Constance (1938) and Henderson (1981) have suggested that the endemism in *Douglasia* represents a classic case of allopatric speciation. Virtually no ecological or phylogenetic studies have been conducted on the genus, in part because of its tendency to grow in remote alpine areas.

While taxonomic opinions differ about generic delimitation of *Douglasia* (see below), the new species is clearly referable to that genus, joining four (or two) other species in Alaska (Fig. 2). One close ally is *D. arctica* W. Hooker, which is known from the northeast corner of Alaska and northern Yukon Territory. Like *D. arctica*, *D. beringensis* has relatively long scapes, broad calyces, and erect leaves, but it differs in having dense stellate pubescence on both leaves and calyx. Leaf pubescence in *D. arctica* is composed of simple marginal hairs only. *Douglasia beringensis* differs from *D. gormanii* Constance of the north-central Alaska Range and western Yukon in having longer scapes, more loosely caespitose growth habit, and a prominently pubescent rather than glabrous calyx. Leaf pubescence in *D. gormanii* is also composed of forked and branched hairs, but they are restricted to the margins and apex and are less dense than in *D. beringensis*. *Douglasia ochotensis* (Willdenow) Hultén (*Androsace ochotensis* sensu Russian authors) of the Bering Strait region, Brooks Range of Alaska and Ogilvie Mountains of Yukon has distinctively recurved leaves, with simple hairs only. The fourth northern species, *D. alaskana* (Coville & Standley ex Hultén) S. Kelso (*Androsace alaskana* according to Yurtsev), is easily distinguished by its unique single-leaf rosette with long jointed hairs (Kelso, 1992). *Douglasia beringensis*, *D. arctica*, *D. ochotensis*, and *D. gormanii* form a group of closely related taxa, probably derivatives of Cordilleran taxa from the area south of the maximum extent of the Pleistocene Cordilleran Ice Sheet.

Douglasia montana A. Gray of Montana, Idaho, Wyoming, and British Columbia is the southern species most similar to *D. beringensis*. We speculate that penetration of an ancestral *D. montana* type into the Alaska–Yukon region may have taken place during climatic and glacial fluctuations of the early Pleistocene at a time before the migration route was blocked by glaciers. Speciation in these original populations probably occurred during subsequent interglacial periods when dry alpine areas were isolated from one another by forested valleys and lowlands. During late Pleistocene glaciation these allopatric populations persisted in remote unglaciated uplands common in Beringia at that time (Hopkins et al., 1982) and may even have expanded their ranges.

The narrow endemism of *D. beringensis* and restriction of habitat to Paleozoic marbles indicate that it may be a species of special concern for conservation and protection by the State of Alaska. Additional populations should be sought on similar bedrock in western Alaska, much of which is little known botanically. In particular, the Kokrines Hills population should be verified and further studies conducted in this region. On the Seward Peninsula, marbles of similar age and chemical composition can be found north of the village of Elim (Till et al., 1986; A. B. Till, pers. comm.), which would also be an area to survey for additional populations.

North American and Russian Delimitation of *Douglasia*

There is some disagreement with respect to the delimitation of the genera *Douglasia* and *Androsace* (Kelso, 1992). Yurtsev (also Korobkov, 1980) refers the taxon called here *Douglasia ochotensis* to the genus *Androsace* due to the shape of its corolla (ellipsoid vs. oblongate in typical *Douglasia* species) and its broader but shorter corolla lobes. Other characters used by Yurtsev to distinguish this species as an *Androsace* rather than a *Douglasia* include a pulvinate growth habit with all internodes of the

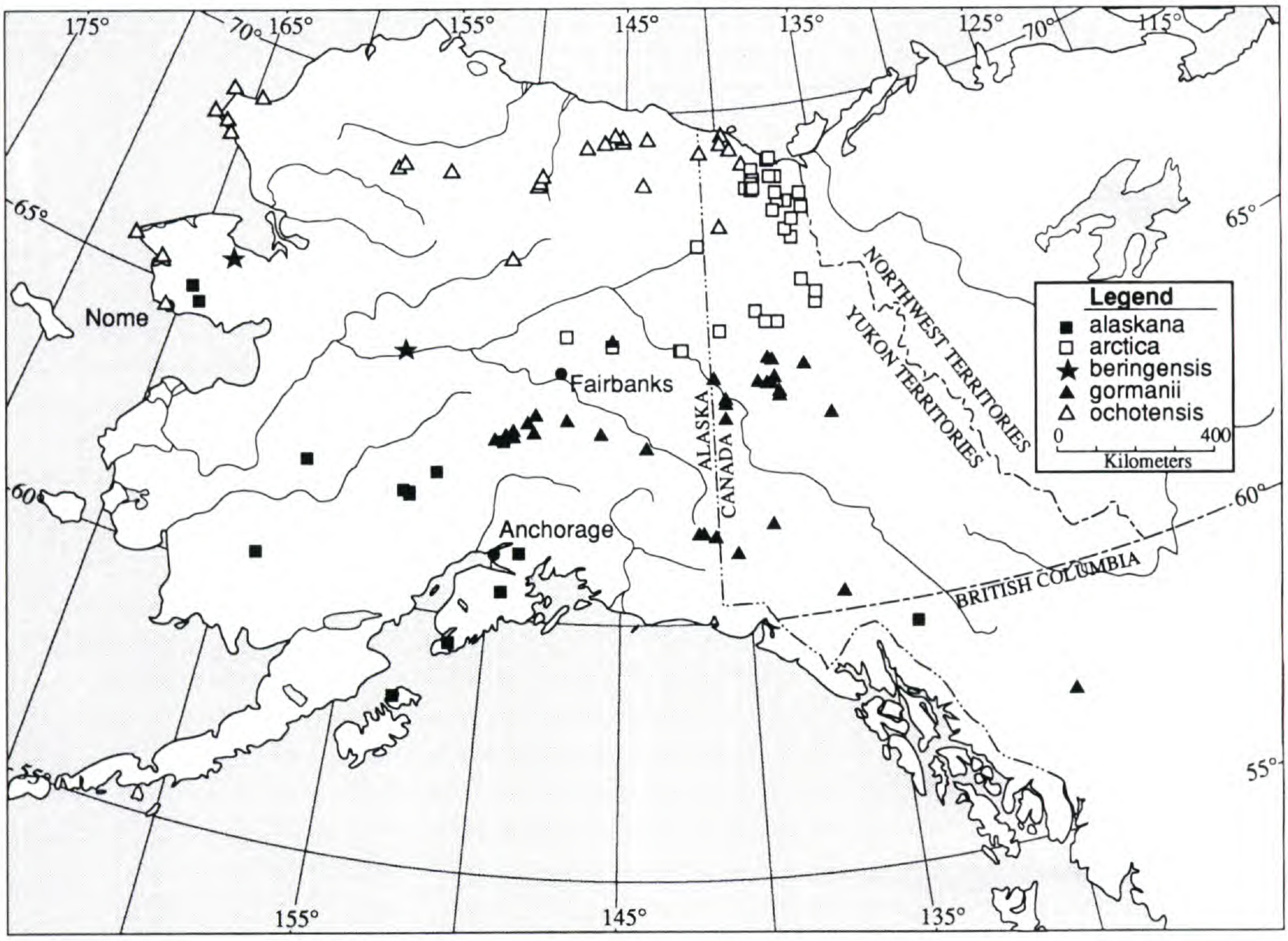

Figure 2. Distribution of northern species of *Douglasia* in North America. Dots may include multiple collections.

vegetative shoots being abbreviated or rarely elongated, even very weakly.

According to the Russian point of view, annual shoots of typical *Douglasia* spp. have the lower internodes more or less elongated, resulting in a mat rather than pulvinate growth form, and the upper leaves in a terminal rosette. In this perspective, *Douglasia* sensu stricto is a purely northwest North American endemic genus.

Because of its chromosome number of $2n = 38$ (consistent with other North American species of *Douglasia*) and other vegetative and reproductive characteristics, Kelso (1992) placed the former *Androsace alaskana* into *Douglasia*. However, Yurtsev (also Korobkov, 1980) prefers to keep this species in *Androsace* sect. *Andraspis* (Duby) Koch, which includes annual to biennial, mostly diploid ($2n = 20$), rosette-forming herbs and a number of perennial, mostly polyploid ($2n = 40$), species, such as *Androsace triflora* Adams, *A. gorodkovii* Ovczinnikov & Karavaev, and *A. semiperennis* Jurtzev.

Key to the Species of *Douglasia* in North America

1a. Plants with a single basal leaf rosette ..... *D. alaskana* (Coville & Standley ex Hultén) S. Kelso
1b. Plants with multiple rosettes or caespitose cushions.
  2a. Stems ± densely covered with marcescent leaves.
    3a. Leaves glabrous above, margins ciliate with simple hairs only ..... *D. arctica* W. Hooker
    3b. Leaves generally pubescent above, sometimes only at the apex, margins with simple, forked or branched hairs.
      4a. Leaves prominently recurved, with simple hairs only; stems with internodes abbreviated ... . *D. ochotensis* (Willdenow) Hultén
      4b. Leaves not prominently recurved, with mostly forked or branched hairs; stems with internodes elongated.
        5a. Calyx and bract glabrous ..... *D. gormanii* Constance

5b. Calyx and bract densely pubescent with branched hairs ..... *D. beringensis* S. Kelso, Jurtzev & D. F. Murray

2b. Stems not densely covered with marcescent leaves.

6a. Flowers solitary or in pairs ..... *D. montana* A. Gray

6b. Flowers more than 2.

7a. Leaves densely pubescent with branched or stellate hairs ..... *D. nivalis* Lindley

7b. Leaves glabrous, sometimes ciliate on the margins.

8a. Leaves 2 mm or less in width, involucre bracts lanceolate ... *D. idahoensis* D. Henderson

8b. Leaves greater than 2 mm in width, involucre bracts ovate ..... *D. laevigata* A. Gray

Acknowledgments. We gratefully acknowledge the financial and logistic assistance of the U.S. National Park Service, with particular thanks to Dale Taylor, Don Chase, Richard Harris, and our helicopter pilots Mike Moore and Jay Shelley. We also thank Alison Till and Julie Dumoulin of the U.S. Geological Survey for their insights on Seward Peninsula geology, Owen Cramer for assistance with the Latin description, Carolyn Crawford for her drawing, and Ray Nelson for his map. Comparative herbarium material was supplied by ALA, CAN, CAS, COLO, DAO, GH, ID, RM, and US.

Literature Cited

Constance, L. 1938. A revision of the genus *Douglasia* Lindley. Amer. Midl. Naturalist 19: 249–259.

Fedorov, A. Editor. 1969. Chromosome Numbers of Flowering Plants. Nauka, Leningrad.

Henderson, D. 1981. A new *Douglasia* (Primulaceae) from Idaho. Brittonia 33: 52–56.

Kelso, S. 1992. Conspectus of the genus *Douglasia* (Primulaceae) with comments on *Douglasia alaskana*, an Alaska–Yukon endemic. Canad. J. Bot. 70: 593–596.

Hopkins, D. M., J. V. Matthews, C. E. Schweger & S. B. Young. Editors. 1982. Paleoecology of Beringia. Academic Press, New York.

Korobkov, A. A. 1980. The genus *Androsace*. Arctic Flora of the USSR. Vol. VIII: 172–185. Nauka, Leningrad. [In Russian.]

Till, A. B., J. A. Dumoulin, B. M. Gamble, D. S. Kaufman & P. I. Carroll. 1986. Preliminary Geologic Map and Fossil Data, Solomon, Bendeleben, and southern Kotzebue Quadrangles, Seward Peninsula, Alaska. U.S. Geological Survey, Open File Report 86-276.

Tigridia estelae (Iridaceae; Tigridieae), A New Species from Durango, Mexico

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ABSTRACT. *Tigridia estelae* sp. nov. from Durango, Mexico, is described and illustrated. It belongs to the *T. multiflora* complex and is closely related to *T. matudae*, from which it differs in the length of style branches, the position and blotching of the tepals, and in its habitat.

The genus *Tigridia* Jussieu is represented in Mexico by at least 27 species, 21 of which are endemic (Cruden, 1975; Molseed, 1970; Calderón de Rzedowski, 1987) and restricted to very small areas. More intensive exploration will probably lead to the discovery of undescribed taxa. While collecting for a study of Mexican monocots in the State of Durango, specimens of a *Tigridia* were gathered, and review of the pertinent literature led us to conclude that it is a new species.

Tigridia estelae López-Ferrari & Espejo, sp. nov. TYPE: Mexico. Durango: El Madroño, carretera El Salto-Mazatlán, 2,350 m, bosque de pino-encino, 29 jul. 1991, *A. R. López-Ferrari 1520, with A. Espejo & M. Flores C.* (holotype, UAMIZ 32934; isotypes, CIDIIR, ENCB, IBUG, IEB, K, MO). Figures 1, 2.

Herba perennis erecta bulbosa, caules usque 40 cm alti, folia basalia 1, linearia, usque ad 35 cm longa et 5 mm lata; folia caulinia 2, linearia, usque ad 18 cm longa et 5 mm lata; spathae valvae subaequales ca. 4.5 cm longae, 1.2–1.4 cm latae, conduplicatae, acutae vel acuminatae; flores plures, erecti, pallide lavendulacei vel liliaci-lavandulacei, 5.5–6.5 cm diametro; tepala conniventia et ad basim cupulam formantia, ad partem crateriformem straminea et violaceo guttata, ad partem mediam purpureo maculata; tepala externa elliptica ubi extensa, acuta, 3.3–4.1 cm longa, 1.5–2 cm lata; tepala interna ovata vel triangula ubi extensa, apiculata, ad basim unguiculata, 2.3–2.5 cm longa, 1.5–1.7 cm lata; glans ad tepalorum partem mediam posita, semicircularis; filamenta connata, ca. 1 cm longa; antherae oblongae, 8–10 mm longae; styli ramuli 8–9 mm longi, bipartiti, violacei; Julii usque Augustii florescet.

Erect bulbous perennial herb to 40 cm tall, glabrous; bulb ovoid to large ovoid, to 4 cm long, 1.3–2 cm broad, the scales thin, pale brown; basal leaf one, linear, plicate, to 35 cm long, 5 mm broad, cauline leaves two, linear, plicate, to 18 cm long, 5 mm broad; flowering stem to 35 cm tall; inflorescence a rhipidium with the spathe valves subequal, ca. 4.5 cm long, 1.2–1.4 cm broad, conduplicate, acute to acuminate, enclosing several flowers. Flowers erect, lavender to lilac, 5.5–6.5 cm diam., the tepals connivent at the base forming a shallow cup, spreading distally, the base dull yellow with violet spots, the middle part with a violet blotch, outer tepals elliptic when extended, acute, 3.3–4.1 cm long, 1.5–2 cm broad, inner tepals ovate to deltoid when extended, apiculate, unguiculate at the base, 2.3–2.5 cm long, 1.5–1.7 cm broad, glands disposed at middle part of the inner tepals, semicircular; filaments connate for ca. 1 cm, anthers oblong, 8–10 mm long; ovary oblong, ca. 7 × 2.5–3 mm, style branches 8–9 mm long, deeply bifid into 2 style arms, violet; young capsules oblong, ca. 1.2 cm long, 3.5 mm broad, mature capsules and seeds not known.

Distribution and habitat. This beautiful species is known only from the type locality and occurs on exposed rocky slopes in forests of *Quercus* and *Pinus* at about 2,350 m (Fig. 3).

Discussion. The new species belongs to *Tigridia* subg. *Hydrotaenia* (sensu Molseed, 1970) and to the *T. multiflora* complex, which includes *T. purpusii* Molseed, *T. multiflora* (Baker) Ravenna, *T. matudae* Molseed, *T. illecebrosa* Cruden, *T. catarinensis* Cruden, and *T. huajuapanensis* Molseed ex Cruden (Cruden, 1975; Molseed, 1970). In these species (except *T. huajuapanensis*) the inner tepals have a well-developed claw and hastate base. Table 1 presents some comparative characteristics that distinguish the species. The species most closely related to *T. estelae* is apparently *T. matudae*, which has style branches one-third to one-half the length of the anthers and the outer tepals apically upturned; in *T. estelae* the style branches are subequal to the anthers and the tepals are spreading (Fig. 1). Moreover, *T. matudae* grows in extremely shady, wooded

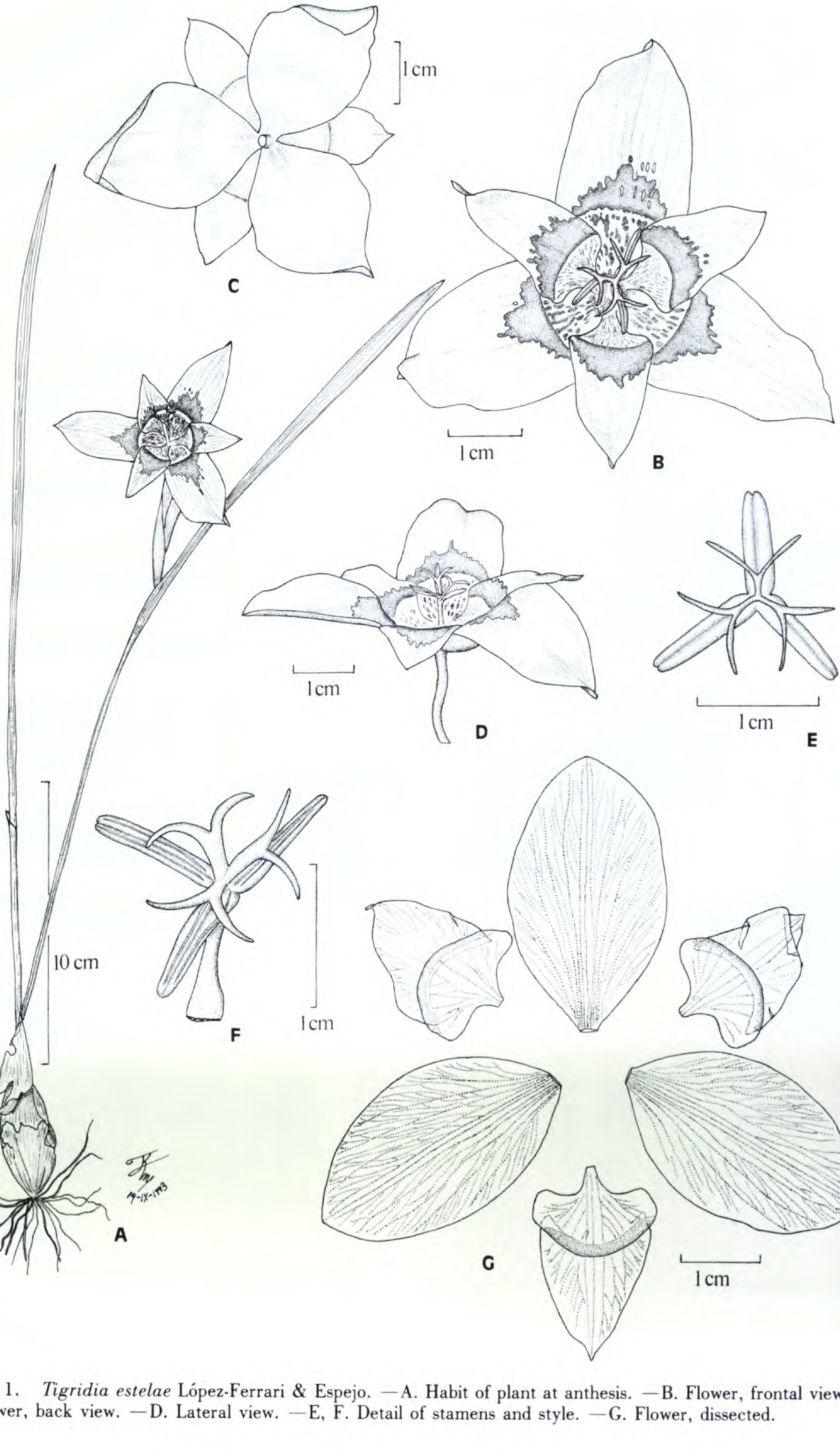

Figure 1. *Tigridia estelae* López-Ferrari & Espejo. —A. Habit of plant at anthesis. —B. Flower, frontal view. —C. Flower, back view. —D. Lateral view. —E, F. Detail of stamens and style. —G. Flower, dissected.

Figure 2. *Tigridia estelae* López-Ferrari & Espejo. —A. Habit of plant at anthesis. —B. Flower, frontal view.

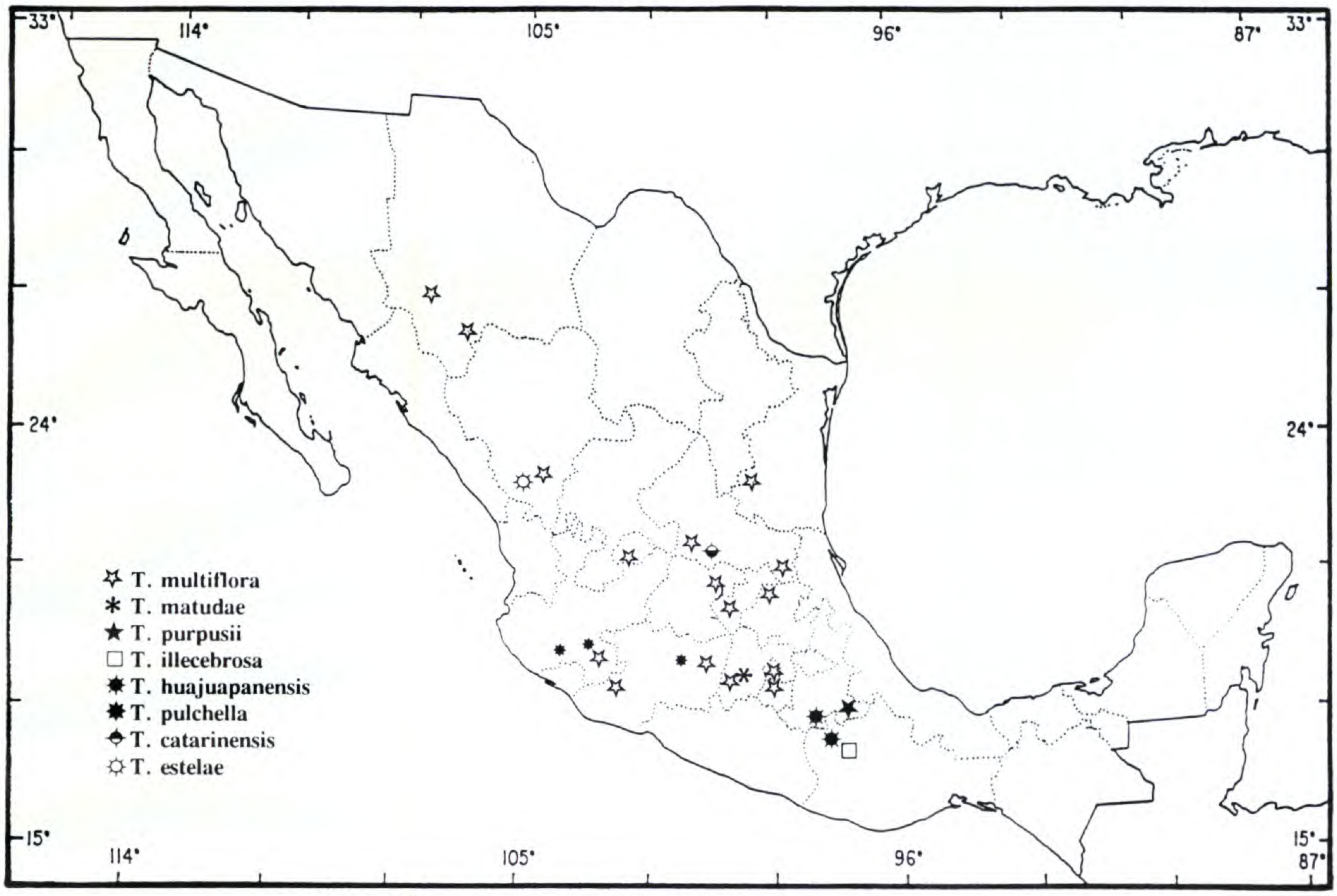

Figure 3. Map showing the distribution of *Tigridia estelae* and its allies.

TABLE 1. Comparative data of some characters of *Tigridia estelae* and its allies.

Species	Height (in cm)	Number of cauline leaves	Number of basal leaves	Flower orientation	Flower color	Capsule form	Distribution (Fig. 3)
T. multiflora (Baker) Ravenna	60	1–2	1–4	erect	purple, purple-brown to rusty lavender orange	clavate	Central and Northern Mexico
T. matudae Molseed	60–85	2	0	erect	light blue violet	oblong-clavate	Edo. de México
T. purpusii Molseed	70	2 or more	1	erect	violet	subglobose	Puebla
T. illecebrosa Cruden	95	3	0	cernuous	tan with maroon streaks	obovate to clavate	Oaxaca
T. huajuapanensis Molseed ex Cruden	15–45	1	2–3	erect	purple brown with yellowish streaks	subglobose	Oaxaca, Puebla
T. pulchella, B. L. Robinson	to 40	1	1	erect	red maroon with white	oblong-clavate	Michoacán, Jalisco
T. catarinensis, Cruden	50–150	2	1–2	erect	maroon with yellow	broadly ovate	San Luis Potosí
T. estelae Lopez-Ferrari & Espejo	to 40	2	1	erect	lavender to lilac	oblong	Durango

situations and *T. estelae* prefers open, exposed habitats.

The name of the species honors María Estela Ferrari de López, mother of the senior author.

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Literature Cited

Calderón de Rzedowski, G. 1987. *Tigridia martinezii*, una especie nueva de Iridáceas del Estado de Hidalgo (México). Bol. Soc. Bot. Mexico 47: 3–6.

Cruden, R. W. 1975. New Tigridieae (Iridaceae) from Mexico. Brittonia 27: 103–109.

Molseed, E. 1970. The genus *Tigridia* (Iridaceae) of Mexico and Central America. Univ. Calif. Publ. Bot. 54: 1–127.

New Names in California Oaks

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ABSTRACT. The following five names are proposed for California oaks: *Quercus john-tuckeri*, nom. et stat. nov. for *Quercus turbinella* subsp. *californica* J. M. Tucker; *Quercus pacifica*, sp. nov.; *Quercus* ×*kinselae*, stat. nov. for *Quercus dumosa* Nuttall var. *kinselae* C. H. Muller; *Quercus durata* var. *gabrielensis* Nixon & C. H. Muller, var. nov.; and *Quercus parvula* var. *shrevei* (C. H. Muller) Nixon, stat. nov. for *Quercus shrevei* C. H. Muller.

In the course of preparing a treatment of the genus *Quercus* in California, we have found it necessary to provide new names for the following five taxa. We are publishing these names in advance of the full study, in order to make them available for floristic treatments currently in preparation.

1. Quercus john-tuckeri Nixon & C. H. Muller, nom. et stat. nov. Basionym: *Quercus turbinella* E. Greene subsp. *californica* J. M. Tucker, Madroño 11: 240. 1952. TYPE: U.S.A. California: San Luis Obispo County, ca. 2 mi. NE of summit of Caliente Mountain, 2 Oct. 1948, *J. Tucker 1886-16* (holotype, UC 938396; isotypes, DAV, BH).

Shrubs 1–3(–5) m tall, subevergreen or evergreen; bark scaly; twigs yellowish or dingy gray, 1–1.5(–2) mm thick, densely tomentulose; buds brown, ovoid or globose, 1.5–2(–3) mm long, glabrous except for the ciliate margins of the scales, lowermost scales often yellowish puberulent. *Petiole* 1–4 mm. *Leaf blade* unicolored, elliptic or obovate, thick and coriaceous, often brittle, (10–)15–30(–40) mm × (8–)10–15(–20) mm; base squarrose or rounded-attenuate, rarely subcordate; secondary veins (3–)4–7, often some of the veins branching near margin and passing into more than one tooth; margin irregularly spinose-toothed, occasionally shallowly lobate; apex acute or rounded; abaxially waxy grayish or light green, with sparse to moderately dense vestiture of (8–)10–12-rayed (loosely) appressed stellate hairs, these often 0.2–0.5 mm diam., and sparse to dense yellowish glandular hairs; adaxially grayish, stellate similar to abaxial surface. *Fruits* solitary or paired, subsessile; cup cup-shaped or obconic to hemispheric, thin, 10–15 mm wide × 5–7 mm deep; scales whitish or yellowish, moderately or scarcely tuberculate, puberulent. *Nut* fusiform, ovoid or conic, apically acute, 20–30 mm long. *Cotyledons* free.

Dry slopes, chaparral, piñon and juniper woodland, margins of oak woodland and sagebrush; 900–2,000 m.

Endemic to California, from Los Angeles County north in the interior Coast Ranges and Sierra Foothills to the northern edge of the Sacramento Valley.

Quercus john-tuckeri bears some resemblance to both *Q. turbinella* and *Q. berberidifolia* Liebmann; however, the former has pedunculate fruit and typically cordate leaf bases, while the latter has a glabrate upper leaf surface, substantially smaller stellate trichomes with fewer rays on the lower leaf surface, heavier, tuberculate acorn cups, and typically nonacute acorns.

At the species level, the epithet *californica* is preoccupied by the illegitimate (but validly published) name *Quercus californica* Torrey ex J. G. Cooper (= *Q. kellogii* Newberry).

2. Quercus pacifica Nixon & C. H. Muller, sp. nov. TYPE: U.S.A. California: Santa Barbara County, rocky slope E of Pelican Bay, Santa Cruz Island, alt. 100 ft., *Ira W. Clokey 4893* (holotype, BH-CHM).

Frutices ad 2 m vel raro arbores ad 5 m, subsempervirentes. Petioli 2–5 mm longi. Lamina foliorum obovata vel oblonga, 15–40 mm longa, 7–20(–40) mm lata, margine integra vel dentata; pagina abaxialis ceracea, glandifera, sparsim stellato-pilosa, pilis paginae abaxialis adpressis; pagina adaxialis viridis, glabra. Nux sessilis, cylindrica vel fusiformis, (15–)20–30 mm longa, (6–)9–15 mm lata, apex acutus.

Shrubs to 2 m tall, rarely small trees to 5 m or taller, subevergreen; bark scaly on older branches and trunk; twigs brownish or reddish and minutely

puberulent, becoming glabrate and gray with age; buds ovate or globose, 2–3 mm long by 1–2 mm thick, light or chestnut brown. *Petiole* 2–5 mm. *Leaf blade* planar to moderately convex or undulate, obovate or oblong, 15–40 mm long by 7–20(–40) mm wide; base cuneate or rounded but attenuate-decurrent along the petiole, leaf tip blunt and rounded, occasionally subacute with a mucronate tip, leaf margin minutely cartilaginous, entire or with 1–5 irregular teeth on each side; secondary veins obscure, 1–5 on each side; abaxially with minute, flat appressed-stellate hairs scattered on the waxy and glandular surface and not obscuring it. *Cup* usually subsessile, paired or solitary in leaf axils, hemispheric to turbinate, enclosing only the base of the nut, to 35 mm wide by 15 mm deep, scales moderately to heavily tuberculate and irregularly formed. *Nuts* acute-cylindric or fusiform, (15–)20–30 mm long by (6–)9–15 mm thick, light brown, glabrate. *Cotyledons* free.

Chaparral, oak woodland, margins of grassland, understory in closed-cone pine stands; 0–300 m.

Quercus pacifica is endemic on three of the California Channel Islands: Santa Cruz, Santa Catalina, and Santa Rosa. It is not known from the mainland but bears a superficial similarity to some of the tree forms that are putative hybrids between *Q. engelmannii* E. Greene and *Q. cornelius-mulleri* Nixon & K. P. Steele in San Diego County. The latter populations, which have been described as *Q.* ×*acutidens* Torrey [pro sp.], differ in having much greater variability in leaf shape, thicker, more coriaceous leaves, denser abaxial leaf vestiture, much smaller hairs typically having more than 10 rays, and variable levels of connation of cotyledons, which are always free in *Q. pacifica*. *Quercus pacifica* appears to be most closely related to *Q. douglasii*, whether by direct descent or by introgression with another species no longer extant on the islands.

3. Quercus ×kinselae (C. H. Muller) Nixon & C. H. Muller, stat. nov. (*Quercus dumosa* Nuttall × *Quercus lobata* Nee). Basionym: *Quercus dumosa* Nuttall var. *kinselae* C. H. Muller, Madroño 5: 157. 1940. TYPE: U.S.A. California: Santa Barbara County, Rattlesnake Canyon Road on Skofield Ranch, alt. 1,000 ft., 30 Oct. 1938, *K. Kinsel 50* (holotype, NA; isotype, CHM-BH).

The name *Quercus townei* E. J. Palmer was described as a hybrid between *Quercus dumosa* and *Quercus lobata*, but its type is intermediate between *Q. durata* var. *gabrielensis* and *Q. lobata*, collected in the vicinity of Pasadena.

4. Quercus durata Jepson var. **gabrielensis** Nixon & C. H. Muller, var. nov. TYPE: U.S.A. California: Los Angeles County, San Gabriel, canyon on N side of hill, Feb. 1861, *W. H. Brewer 165* (holotype, US).

Frutices sparsim ramosae, inordinatae. Lamina foliorum aliquantum cotyliformis, vel interdum planiuscula, pagina adaxialis viridis, nitida, plerumque glabra vel sparsim stellato-pilosa; pili paginae adaxialis plerumque 2–4 mm longi, radii arcuati, curvati vel recti, non crispati.

Shrubs, openly branched, scraggly. *Leaf blade* moderately cupped, sometimes almost planar. *Adaxial leaf surface* green, glossy, usually glabrate or with sparse stellate pubescence; abaxial leaf hairs usually 2–4 mm long, rays arched, curved or straight, not curly.

Chaparral on dry, exposed loose slopes on non-serpentine soils; 450–1,000 m.

This variety occurs only in Los Angeles County, California, on the south slope of the San Gabriel Mountains from La Cañada to Pomona. In this area along the lower elevational limits of *Q. durata* var. *gabrielensis*, occasional intermediates with *Q. engelmannii* occur (*Quercus* ×*grandidentata* Ewan [pro sp.]). These putative hybrids are large shrubs or small trees with leaves that are persistently woolly on the abaxial surface and have coarse, regular teeth. Most of these hybrids have been eliminated by the same uncontrolled urban growth that has largely exterminated *Q. engelmannii* in this area.

5. Quercus parvula E. Greene var. **shrevei** (C. H. Muller) Nixon, stat. nov. Basionym: *Quercus shrevei* C. H. Muller, Amer. Midl. Naturalist 19: 587. 1938. TYPE: U.S.A. California: Monterey County, ridgetop in Palo Colorado Canyon, ca. 4 mi. from the ocean, *Shreve 104* (holotype, originally at Desert Laboratory, Tucson, now at ARIZ; isotype CHM-BH).

Small to large trees, sometimes shrubby in exposed sites, to 20 m tall; bark gray, smooth to lightly furrowed; twigs greenish or brown, 2–3 mm thick, glabrous to sparsely pubescent; buds dark brown, 4–12 mm long, silky pubescent, the scales acute. *Petiole* 2–25 mm long, sparsely pubescent on adaxial surface. *Leaf blade* oblong to lanceolate, (25–)35–75(–105) × 20–35 mm, leathery, base rounded or subcordate; margin usually entire, rarely spinose; apex acute or subacute. *Staminate catkins* yellowish or reddish, 20–80 mm long, glabrate, stamens 4–5(–7). *Styles* 3–4. *Fruits* 1–3, subsessile or on stout peduncles to 3–5 mm; cup deeply cup-shaped, 20–25 mm deep, 15–25 mm wide, the rim

often invaginated, scales acute, silky-pubescent. *Nut* light brown, often puberulent, cylindric, globose or somewhat tapered, apically rounded, 20–45 × 15–20 mm. *Cotyledons* free.

Mixed evergreen forest and redwood forest; 0–1,000 m; flowering April–May.

Outer Coast Ranges of central California, from San Luis Obispo County north to Marin County.

Acknowledgments. We thank Henk van der Werff for correcting the Latin descriptions.

Maharanga squamulifera (Boraginaceae), a New Species from Thailand and its Morphological and Phytogeographical Implications

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ABSTRACT. *Maharanga squamulifera* Riedl is described from northern Thailand, a remarkable extension of the range of the genus. Its most important characters are the presence of linear scales at the base of the corolla, the smooth and glabrous tips of the anthers, the scarcely distinct differences in the attachment of the filaments, and the distinctly glabrous nutlets.

Maharanga squamulifera Riedl, sp. nov. TYPE: Thailand. Chiang Mai: northern Thailand, higher elevation of Doi Chiang Dao, 1,900–2,100 m, on rocky mountain ridge of limestone near summit, 26 Sep. 1971, *Gen Murata, Kunio Iwatsuki & Chamlong Pengklai T-15282* (holotype, L; isotype, KYO).

Herba pluricaulis caulibus simplicibus, foliis basalibus rosulatis, caulinis densis, lineari-lanceolatis vel anguste lanceolatis, acutis, supra subtusque densissime appresse strigosis, bracteis calyce brevioribus, calyce in tertia parte inferiore vel usque ad medium connato, 7–10 mm longo, corolla opace purpureo-coerulea, 1.2–1.3 cm longa, clavata, paulo ultra medium inter lobos profunde longitudinaliter plicata, extra densissime appresse pilosa, intus ad basin filamentorum et ad imam basin barbata, annulis 5 extra impressis ad insertionem filamentorum ornata, squamulis 5 elongato-linearibus ad basin in loco annuli nectariferi instructa, antheris basi sagittata cohaerentibus, inclusis, apice sterili truncatis, stylo corollam longe superante valde insignis.

Plants perennial, with a sterile rosette. Stems several, 35–60 cm high, unbranched, erect, brownish to dark brown at lower part, densely covered with patent, ferrugineous hairs ca. 2 mm long. All leaves linear-lanceolate, acute, darker green on upper side, pale on lower, with revolute margins, densely covered with very slender, ± appressed hairs arising from circles of mineralized cells on the upper side only; rosette leaves 6–12 cm long, 0.5–1.2 cm wide at the broadest place slightly above middle, gradually tapering into a winged petiole 2–4 cm long; lower stem leaves already dry at flowering time, middle and upper leaves sessile, very dense, gradually decreasing in size, 2–6.5 cm long, 0.3–1(–1.2) cm wide, tapering toward base from about middle, uppermost leaves broadest near base. Cymes usually in pairs, with 7–12 flowers, scorpioid, about 2–2.5 cm diam., elongated to about 3.5 cm after flowering, sometimes a reduced cyme or a single flower in axil of uppermost leaf; bracts linear, broadest at base, 4–12 mm long, 1.2–2 mm wide, acute, otherwise like the leaves. Pedicels densely covered with patent, ferrugineous hairs, 1–5 mm long in flower, elongated to 5–7 mm afterwards, in single flowers up to 10 mm, straight or slightly curved. Calyx 7–10 mm long, lobes free in upper half or two-thirds, linear to linear-lanceolate or linear-triangular in flower, narrowly triangular later on, acute, densely covered with ferrugineous hairs, hairy also on inner side. Corolla dark purplish blue, 1.2–1.3 cm long, ± clavate, in compressed state about 5 mm wide, constricted below lobes, with 5 deep folds from the sinuses between lobes downwards for about two-thirds of corolla length, outside densely covered with short, appressed, retrorse hairs except for lowermost part, with 5 deep, ringlike to elliptic impressions where the filaments attached inside; lobes from a truncate, slightly convex base abruptly tapering into shortly triangular apex, acute, revolute; corolla inside bearded at the very base and at base of filaments, sparsely hairy between these two rings of hairs, glabrous above upper ring; scales 5, linear, ca. 1 × 0.2 mm, rounded at apex, resembling faucal appendages, located at corolla base and replacing the nectary ring. Filaments inserted ca. 2.5–3 mm above corolla base, 4.5 mm long, with a broadly lanceolate lower part up to 1 mm wide and unequal in width among the 5 stamens, with medial or eccentric vein, tapering into a flattened-filiform upper part; anthers attached at ca. 1.5 mm above their base, 5.5(–6) mm long, sagittate, coherent with their bases, completely included in corolla, sterile apex truncate, 1.5 mm long. Style filiform, 1.3–1.6 cm long, distinctly longer than corolla; stigma minute, bilobed. Nutlets 4, known only at a very young stage, hood-shaped, rounded at apex, sessile, with a large, rhombic, basal attachment scar, not papillate or muriculate.

The most peculiar features of *Maharanga squamulifera* are the scales in place of a nectary ring at the corolla base. They strongly resemble the faucal scales present in many other genera of the Bor-

aginaceae and absent from most genera of the Lithospermeae, to which *Maharanga* A. DC. belongs. The attachment of filaments, which was described by Johnston (1954) in some detail, is not so typical in *M. squamulifera* as in the other species of *Maharanga*. Two filaments have a distinctly eccentric midvein, but their attachment is not markedly oblique or clearly arcuate when the vein is medial. Furthermore, the filaments in *M. squamulifera* are not distinctly decurrent, and they differ in the width of their lower half. Another character that sets the new species apart from the other species of *Maharanga* is the sterile tip of the connective, which is toothless and without ascending hairs along its margin. The immature nutlets are glabrous, smooth, and neither papillate nor muriculate, but this aspect might change at maturity. The connective and nutlets are more similar to *Onosma* L. than to other species of *Maharanga*. The scales at the corolla base are unique to *M. squamulifera*. However, the calyx lobes, which are free only in their upper part, the longitudinal folds of corolla, the impression at the place of attachment of filaments, and the shape of corolla lobes are typical for *Maharanga*. Pollen grains have not been examined for this study. Although *Maharanga squamulifera* resembles *Onosma* in the nutlets and connective, the differences are sufficient to include it in *Maharanga* and to support the separation of *Maharanga* from *Onosma*.

Maharanga is distributed in the central and eastern Himalayas and adjacent parts of southwestern China (Yunnan) and India (Assam). The discovery of *M. squamulifera* is a remarkable extension of the genus range in southeastern Asia and the first report from Thailand. Assam is the nearest region where other members of the genus grow. As presently circumscribed, *Maharanga* includes ten species and is centered in Nepal.

Paratype. NORTHERN THAILAND. **Payap:** Doi Chiengdao, low brushwood with stunted trees on exposed ridge, ca. 2,000 m, 7 Dec., *E. Hennipman 3286* (L).

Acknowledgment. I thank Ihsan Al-Shehbaz for help with the manuscript.

Literature Cited

Johnston, I. M. 1954. Studies in the Boraginaceae, XXVI. Further revaluations of the genera of the Lithospermeae. J. Arnold Arbor. 35: 1–81.

A New Species of *Hymenocallis* (Amaryllidaceae) in the Florida Panhandle

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ABSTRACT. A new species of spider-lily, *Hymenocallis godfreyi*, is described and illustrated. It is a rare endemic that occurs in the St. Marks marsh at the confluence of the St. Marks and Wakulla Rivers, Florida. Its striking features are contrasted to an allied species, *Hymenocallis rotata* (Ker-Gawler) Herbert.

The taxonomy of the spider-lilies, *Hymenocallis* (Amaryllidaceae), inhabiting the clear water of springs and spring-fed streams in north Florida has presented a perplexing problem. There is little consensus about the identities of these populations (Small, 1933; Morton, 1935; Sealy, 1954; Traub, 1962; Clewell, 1985). Godfrey & Wooten (1979) stated that it was futile to attempt to delimit spider-lily species because of the scarcity and poor quality of many spider-lily herbarium specimens and because so little literature has been published about spider-lily populations in the wild.

Along the Wakulla River south of Tallahassee, magnificent clumps of spider-lilies with large starlike flowers delight canoers and other boaters each June. Field and herbarium studies of these have revealed that they are distributed in spring-run systems extending to the Atlantic coast of Florida and down the peninsula.

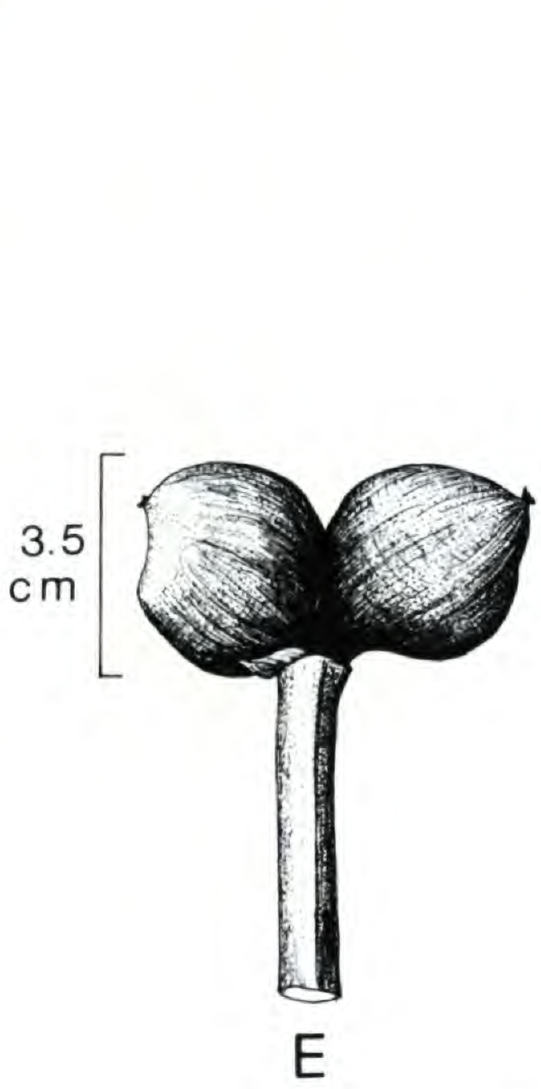
A review of pertinent taxonomic literature indicates that these populations have been described as *Pancratium rotatum* Le Conte (1836), *Hymenocallis laciniata* Small (1933), and *H. floridana* (Rafinesque) Morton (1935), but all of these names are considered to be synonyms. The name determined to have priority is *Hymenocallis rotata* (Ker-Gawler) Herbert (1821). Ker-Gawler (1805) described the species as *Pancratium rotatum* in the *Botanical Magazine*. He presented a description and a plate showing a flowering scape. The flowers, drawn in intricate detail, are unmistakably the unique form displayed by the north Florida spring-inhabiting spider-lily species.

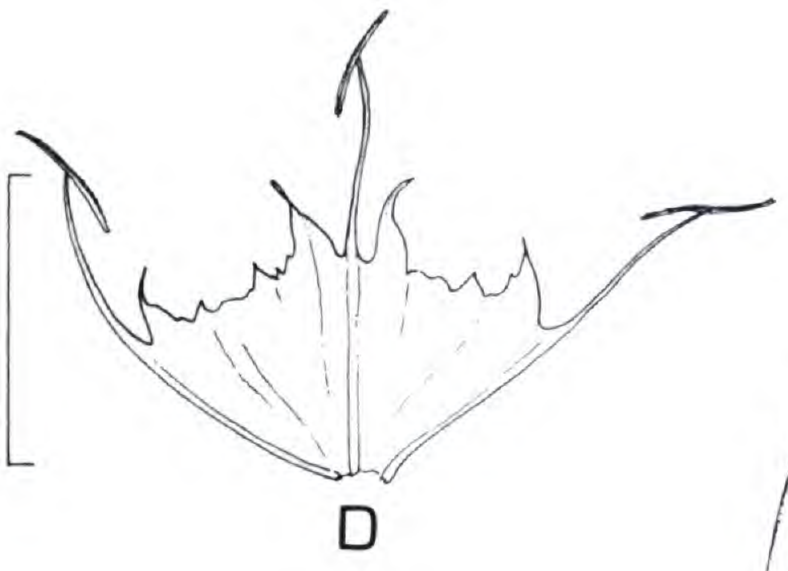
At the confluence of the St. Marks and Wakulla Rivers at the community of St. Marks, which is about 20 miles south of Tallahassee, is a slightly brackish marsh dominated by *Juncus roemerianus* Scheele and *Cladium jamaicense* Crantz. In years when the marsh has been burned in the winter, an amazing display of a two-flowered spider-lily begins by early to mid March. Within a few weeks, the plants dominate the landscape (Robert Godfrey, pers. comm.).

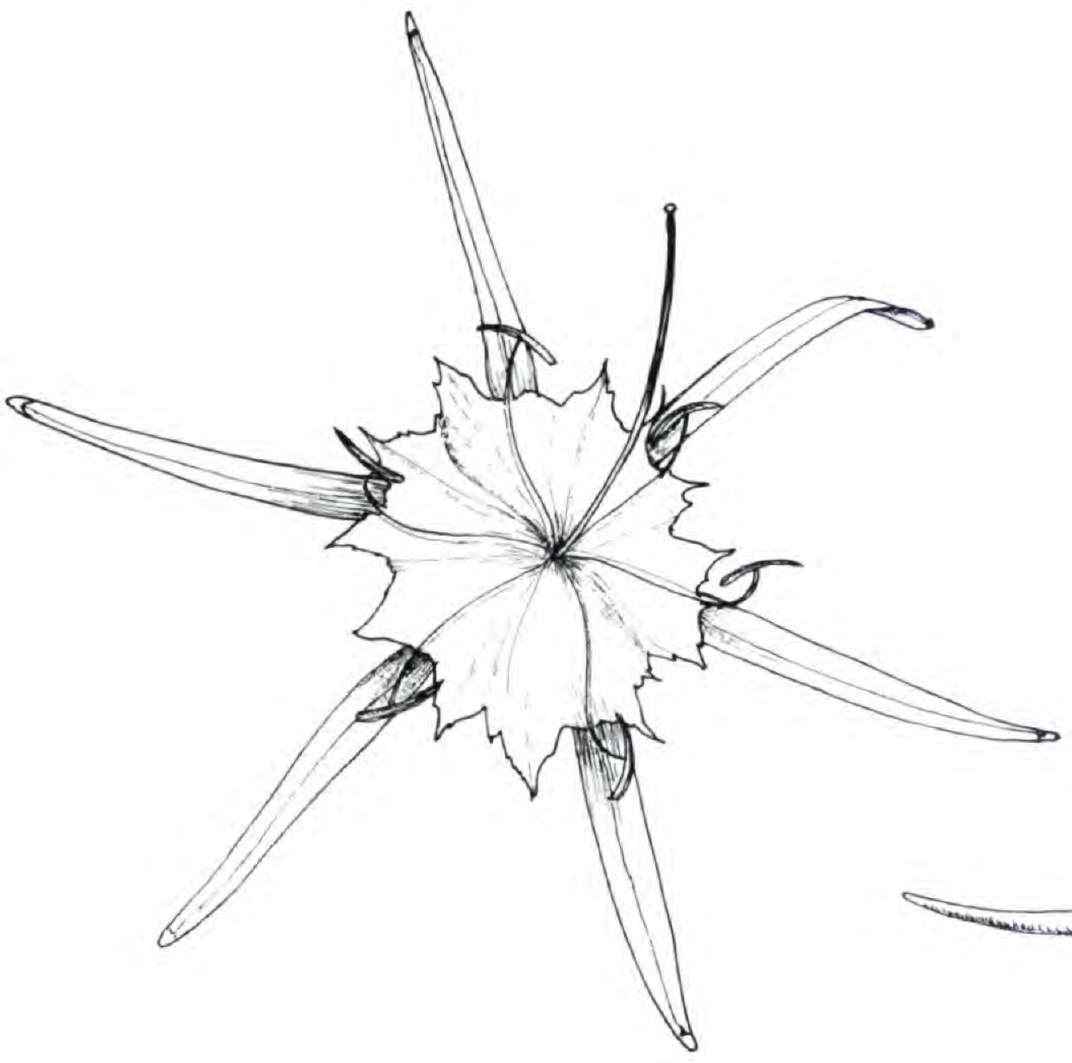
In spring of 1990, Robert Godfrey brought this spider-lily to the attention of the authors for critical analysis. He supplied us with descriptions of field characteristics, vouchers, and bulb collections. We compared the characteristics of this marsh spider-lily to those of *Hymenocallis rotata*, to which it appeared similar. Although some similarities exist, as will be discussed below, there are notable differences in the bulbs, leaves, flowers, capsules (Fig. 1), and in the habitats and flowering times of the two. On the basis of these differences, the marsh spider-lily was considered a separate species, *H. godfreyi*.

The measurements presented in the description, with the exception of the seed and fruit dimensions, were made from pressed dried herbarium specimens. Therefore, useful comparisons can be made with other herbarium specimens of *Hymenocallis*.

Both *Hymenocallis rotata* and *H. godfreyi* have $2n = 48$ chromosomes, indicating that they are related. A drawing of the chromosomes of *H. godfreyi* is shown in Figure 2. A preliminary comparison of the karyotype of the marsh spider-lilies with that of *H. rotata* indicates that although there are a number of common chromosome types there are also some differences in the chromosome types be-







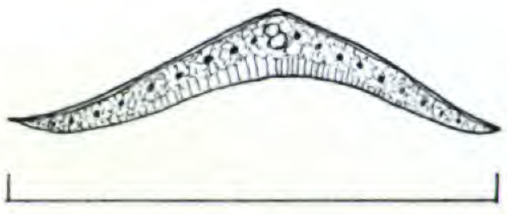


Figure 1. *Hymenocallis godfreyi* G. Lom. Smith & M. Darst. —A. Habit. —B. Leaf cross section. —C. Flower frontal view. —D. Section of staminal cup. —E. Fruits. —F. Seed. (Based on *Godfrey 83721;* drawn by M. Darst.)

tween the two. Variability in chromosome types and numbers in the spider-lilies is well documented (Flory, 1975, 1976; Smith & Flory, 1990).

Hymenocallis godfreyi G. Lom. Smith & M. Darst, sp. nov. TYPE: U.S.A. Florida: Wakulla Co., San Marcos de Apalache, marsh near confluence of Wakulla and St. Marks Rivers, 16 Mar. 1990, *Godfrey 83721* (holotype, FSU; isotypes, FLAS, MO, NY, USF). Figure 1.

Herba bulbo ovoideo, rhizomatoso, 3–4.5 cm longo, 2.5–3.5 cm lato, collo 2–3 cm longo; scapo ancipiti, non glauco, 2–3 dm longo. Folia 3–6, lorata, coriacea, non glauca, flavovirentia, (1.3–)2–3.8 dm longa, 1–2(–2.5) cm lata. Flores 2; perianthii tubo viridi, 4.5–7.5(–8.5) cm longo, segmentis 7–10.5 cm longis, 5–8 mm latis; poculo staminali infundibuliformi, marginibus erectis, 3–4(–4.5) cm longo, 5 cm lato; filamentis liberis (1.5–)2–3 cm longis; antheris 1.2–1.5 cm longis; polline aureo. Capsula subglobosa, 3.5 cm longa, 2.5 cm lata; seminibus carnosis, obovoideis, viridibus, 2–2.5 cm longis, 1.3–1.8 cm latis.

Bulb ovoid, rhizomatous, 3–4.5 cm long, 2.5–3.5 cm wide, neck 2–3 cm long, caudex 1.5–2.0 cm long, tunica papery gray. Leaves 3–6, lorate, channeled, coriaceous, nearly erect, nonglaucous, yellow-green, apex obtuse to subacute, (1.3–)2–3(–3.8) dm long, 1–2(–2.5) cm wide, deciduous, appearing with the scape. Scape two-edged, nonglaucous, 2–3 dm long; 2 scape bracts enclosing the bud, 4–5 cm long, 1–1.5 cm wide, each flower with a subtending, narrowly lanceolate bract, 3.5–5 cm long, 0.5–1.0 cm wide. Flowers 2, one opening slightly before the other, sessile, slightly diverging, fragrant; perianth tube green, 4.5–7.5(–8.5) cm long; perianth segments linear-lanceolate, slightly ascendent, white with sepals green-striped on keel, 7–10.5 cm long, 5–8 mm wide. Staminal cup white with small yellow-green eye, broadly funnelform, margins erect, two prominent dentate horns between each free filament, 3–4(–4.5) cm long, ca. 5 cm wide; free filaments white, slightly incurved, inserted at a flattened base, (1.5–)2–3 cm long; anthers 1.2–1.5 cm long, pollen golden. Style green in upper half, fading to white, 13–17 cm long, stigma capitate. Ovary oblong to slightly pyriform, 1.5–2.5 cm long, ca. 1 cm wide; ovules 4 per locule. Fruit a subglobose, leathery, green capsule, ca. 3.5 cm long, 2.5 cm wide. Seeds fleshy, obovoid, green, 2–2.5 cm long, 1.3–1.8 cm wide.

Hymenocallis godfreyi, the St. Marks marsh spider-lily, is a rare endemic that grows in a seemingly fire-dependent habitat. It begins to bloom in early to mid March in areas of the marsh burned during the winter. Flowering continues into May.

Figure 2. Chromosomes of *Hymenocallis godfreyi* at mitotic metaphase prepared by G. Lom. Smith from *Godfrey 83697*. The scale equals 10 μm. (Ink preparation by M. Garland.)

The bulb is small, narrowly ovoid, and rhizomatous. At anthesis, *H. godfreyi* is distinguished by its short scape, short, coriaceous, yellow-green leaves, broadly funnelform staminal cup with dentate marginal horns, and short perianth tube. At maturity each scape bears two subglobose fruits.

In contrast, *Hymenocallis rotata* grows along spring-run streams of northern and peninsular Florida and blooms from early June to early July. It has large, coriaceous, strap-shaped, deep green leaves reaching nearly a meter in length and 4–5(–7) cm in width. The bulb system is massive, and, as with *H. godfreyi*, is rhizomatous. The flowering scape has 2–4 flowers. At full anthesis, the staminal cup is nearly rotate with a tubulose base and measures 4.5–5.5 cm in length and nearly 8 cm in diameter; the dentate horns of the staminal cup margin are highly prominent. The perianth segments extend horizontally from the base of the staminal cup and are about the same length as the perianth tube. The capsules are obovoid and elongated at maturity.

Although there are distinct differences between *Hymenocallis godfreyi* and *H. rotata*, there are also similarities, as in the pattern of the staminal cup margin, the size and insertion of the free filaments, the anther size, and chromosome number. The location of this marsh spider-lily with respect to the range of *H. rotata* and the similarities between the two indicate that *H. godfreyi* probably evolved from *H. rotata*.

During the Pleistocene, dispersal of *Hymenocallis rotata* seeds likely occurred down the St. Marks River to the marsh. The spider-lilies probably became established in the marsh and began to respond to the new environmental conditions as natural selection influenced the development of the marsh population toward its present form. Divergence has progressed to the point that the authors believe these distinctive plants warrant classification as a new species.

This new species is named in honor of Robert K. Godfrey, Professor Emeritus of Florida State University. Godfrey has provided much encouragement and support for spider-lily studies by assisting with numerous field studies, making numerous bulb and seed collections, preparing the highest quality herbarium vouchers, and providing the identification of associated plants.

Paratypes. U.S.A. **Florida:** Wakulla Co., San Marcos de Apalache, marsh near confluence of Wakulla and St. Marks Rivers, 1843 or 1845, *Rugel 165* (FLAS), 14 Mar. 1976, *Godfrey 74656* (FSU, GA, MO, NCU), 20 Mar. 1976, *Leonard 6240* (FSU), 5 Mar. 1990, *Godfrey 83697* (FLAS, FSU, MO), 22 Mar. 1990, *Godfrey & Gholson 83742* (FSU, FTG, GA, MO, Herb. Gholson), 31 Mar. 1991, *Godfrey 84076* (FSU).

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Literature Cited

Clewell, A. F. 1985. Guide to the Vascular Plants of the Florida Panhandle. Florida State Univ. Press, Tallahassee.

Flory, W. S. 1975. Chromosome numbers for several species of *Hymenocallis*. Plant Life 31: 56–63.

———. 1976. Distributions, chromosome numbers and types of various species and taxa of *Hymenocallis*. The Nucleus 19: 204–227.

Godfrey, R. K. & J. W. Wooten. 1979. Aquatic and Wetland Plants of Southeastern United States. Monocotyledons. The Univ. Georgia Press, Athens.

Herbert, W. 1821. Appendix to Bot. Reg., 44.

Ker-Gawler, J. 1805. *Pancratium rotatum*. Large-crowned *Pancratium*. Bot. Mag. 21: pl. 827.

Le Conte, J. 1836. Observations on the United States species of the genus *Pancratium*. Ann. Lyceum Nat. Hist. New York 3: 142–148.

Morton, C. V. 1935. A check list of the bulbous Amaryllidaceae native to the United States. Yearb. Amer. Amaryllis Soc. 2: 80–83.

Sealy, J. R. 1954. Review of the genus *Hymenocallis*. Kew Bull. 1954: 201–240.

Small, J. K. 1933. Manual of the Southeastern Flora. Published by the Author, New York.

Smith, G. L. & W. S. Flory. 1990. Studies on *Hymenocallis henryae* (Amaryllidaceae). Brittonia 42: 210–220.

Traub, H. P. 1962. Key to the subgenera, alliances and species of *Hymenocallis*. Plant Life 18: 55–72.

New Taxa and Nomenclatural Changes in *Aralia* (Araliaceae)

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ABSTRACT. Based on work toward a revision of *Aralia* (Araliaceae), three new taxa are described: *Aralia chinensis* L. var. *longibractea*, *A. elata* (Miquel) Seemann var. *ryukyuensis*, and *A. gintungensis* C. Y. Wu var. *multinervis*. The following nomenclatural changes are made: *A. debilis* J. Wen, nom. nov., *A. dasyphylloides* (Handel-Mazzetti) J. Wen, comb. et stat. nov., *A. elata* (Miquel) Seemann var. *inermis* (Yanagita) J. Wen, comb. nov., *A. elata* (Miquel) Seemann var. *mandshurica* (Ruprecht & Maximowicz) J. Wen, comb. et stat. nov., and *A. bipinnata* Blanco var. *apoensis* (Elmer) J. Wen, comb. et stat. nov. A taxonomic key to the varieties of *A. elata* is provided.

Aralia L. (Araliaceae), as it was recently defined (Wen, 1993), consists of 51 species, distributed primarily in China and southeastern Asia (about 40 species). It also occurs in the Americas, from Canada to Argentina, Bolivia, and Peru. Two sections (sects. *Aralia* and *Dimorphanthus* Miquel) have a classical eastern Asian and North American disjunct distributional pattern. In-depth phylogenetic and biogeographic studies of *Aralia* are in progress, using both morphological characters and DNA sequencing data. Toward a comprehensive treatment of *Aralia*, three new varieties are recognized and a few nomenclatural changes are made.

Aralia debilis J. Wen, nom. nov. Replaced name: *Aralia elegans* C. N. Ho, Acta Phytotax. Sin. 1: 77. t. 6. 1952; not *Aralia elegans* Linden ex Decaisne & Planchon, Rev. Hort. 3: 108. 1854. TYPE: China. Guangxi: Yao Shan, Kuchen, July 1931, *S. S. Sin 21672* (holotype, IBSC).

Distribution. A rare species in Guangdong and Guangxi provinces of China; scattered in mountain valleys and thickets; 850 m.

Additional specimens examined. CHINA. **Guangdong:** Lechang Xian, *Chen 213* (IBSC); Liannan Xian, Baimang Xiang, Bandong, 850 m, *Tan 58970* (IBSC); Qingyuan Xian, *Wang 30706* (IBSC); Bingjiang, Tian Tang Shan, *Wen 493* (OS). **Guangxi:** Da Yao Shan Xian, on the way from Hengcong village to Wulingchang, *Li 400344* (IBSC); Yao Shan, *Sin 853* (IBSC); Yao Shan, Tseungyuen, *Wang 39596* (A, IBSC).

Aralia dasyphylloides (Handel-Mazzetti) J. Wen, comb. et stat. nov. Basionym: *Aralia chinensis* L. var. *dasyphylloides* Handel-Mazzetti, Symb. Sin. 7: 704. 1933. TYPE: China. Guangdong: Mandse-schan, near the border with Hunan toward Guiyang, 1915, *Mell 556* (holotype, WU).

This species has been widely misidentified as *Aralia dasyphylla* Miquel (e.g., Li, 1942; Ling, 1977; Hoo & Tseng, 1978; Shang, 1985). *Aralia dasyphylla* was described by Miquel in 1856 based on material from Java. *Aralia dasyphylloides* differs from *A. dasyphylla* in its oblong (vs. ovate) leaflets with acute (vs. acuminate) apices, pale grayish to yellowish green and tomentose (vs. green and appressed pubescent) abaxial leaflet surface, densely tomentose (vs. appressed pubescent) inflorescence, smaller, triangular and less pubescent bracts and bracteoles (vs. larger, narrowly triangular or lanceolate and densely pubescent), pink to purple (vs. greenish brown) infructescence, and globose to subglobose (vs. ovoid-globose) fruits. Geographically, *A. dasyphylloides* is distributed in southern, eastern, and central China, whereas *A. dasyphylla* occurs in Java, Sumatra, and the Malay Peninsula.

Distribution. In Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Sichuan, and Zhejiang provinces of China; it may also occur in Vietnam; on rocky slopes, mountain slopes, hillsides, roadside, along streams and ravines, in thickets and secondary forests; mostly on dry sandy soil and in sunny habitats; a pioneer species; 200–1,300 m.

Representative specimens. CHINA. **Anhui:** Huangshan, *Chen 1135* (NF). **Fujian:** Saowu Hsien, Huilin, *Zhou 6135* (IBSC). **Guangdong:** Canton, Wat Shui Shan, *Chun 7392* (E); Tsing Wan Shan, Wong Chuk I and vicinity, Wung Yuen District, *Lau 2323* (GH); Yang-chi, Yao-shan, 600 ft., *Sin 9944* (A), *11517* (A, NY); Paak Tuen Shek, Taai Tsan, Ying Tak, *Tsang & Wong 2320* (A); Tin Tong Kin, Chong Uen Shan near Kau Fung, Loh Ch'ang District, *Tsang 20811* (A, L, MO, NY, UC, W); Tung Koo Shan, Tapu District, *Tsang 21777* (A, G, NY);

on the way to Jai-feng, Lokchang, *Tsiang 1215* (E, UC), *1216* (A); Wat Shui Shan, Kook Kiang, North River region, *Wang & Ling 7392* (UC). **Guangxi:** Po Yam Shan (along Guangdong border), near Tai Chung village, Sun-to District, *Tsang 22989* (G, GH, W). **Guizhou:** Libo, Wong Ang Tree Farm, 620 m, *Song 1122* (NF); Ta Ho Yen, Fan Ching Shan, 900 m, *Steward et al. 829* (A, BM, N, NY, W); Tuhshan, 400–530 m, *Tsiang 6884* (IBSC, MU, NAS, NY). **Hubei:** Hefeng, *Ling 739* (HIB); Lichuan, Xing-dou-shan, Xiao-jia-wan, 780 m, *Tang & Song 808* (HIB, NAS); Yingshan Xian, Tao Hua Cong (Peach Flower Valley), *Wen 620* (OS). **Hunan:** Temple Wulingan in Mount Yun-schan near Wukang, 600–800 m, *Handel-Mazzetti 12528* (WU); Hsinhwa, Hsikwang-schan, 800 m, *Handel-Mazzetti 12662 = 806* (A, WU). **Jiangxi:** Ping-xiang, Nanyuan, 300 m, *Jiangxi Exped. Team 2693* (PE); Sai Hang Cheung near Tung Lei Village, Kiennan District, *Lau 4224* (A, BM), *4363* (A, BM, G); Wu-yi-shan, 600 m, *Wang 2539* (PE); Lushan, Gulin, *Wen 607* (OS). **Sichuan:** Wuxi Xian, Banxi Xiang, Huang-jia-po, 1,300 m, *Yang 65332* (IBSC). **Zhejiang:** Tian-mushan, *He 0322* (IBSC).

Aralia chinensis L. var. **longibractea** J. Wen, var. nov. TYPE: Malaysia. Sarawak: Kelabit highland, Bario, 4th Division, 7 Nov. 1974, *P. Chai S. 35356* (holotype, MO; isotypes, A, CGE not seen, K, L not seen, MO).

Plantae bracteis longis. Bracteae secundariae lanceolatae–lineares, 15–25 mm longae, interdum foliiformes vel cochleariformes, 5–7 cm longae; bracteolae lanceolatae–lineares, 5–15 mm longae. Pedicelli (10–)13–16(–21) mm longi.

Unbranched spiny shrubs or treelet, 4–7 m tall. Stem up to 15 cm diam., prickly, prickles conical, up to 8 mm long, outer bark brown, inner bark greenish yellow, sapwood white. Leaves bipinnate, 100–250 cm long, with ca. 5 pairs of lateral pinnae, tomentose. Inflorescence densely brownish tomentose, up to 150 cm long, branching in 2–4 orders; secondary bracts lanceolate to linear, 15–25 mm long, sometimes becoming ± leaflike, ± spoon-shaped, 5–7 cm long; bracteoles lanceolate to linear, 5–15 mm long; umbels 20–50-flowered, pedicels (10–)13–16(–21) mm long. Flowers greenish yellow or whitish, slightly lemon-scented.

Vernacular names. Tepak-paluk (Sarawak of Malaysia).

Phenology. Flowering from August to December.

Distribution. In Sabah and Sarawak; a pioneer species in weedy secondary thickets or forests; 200–1,250 m.

This variety differs from *A. chinensis* var. *chinensis* by its more densely pubescent leaves and inflorescences, larger, especially longer and more striking bracts and bracteoles, and longer pedicels (mostly 13–17 vs. 9–13 mm long). It also appears more robust than the typical variety.

The two varieties of *A. chinensis* are geographically separated by over 2,000 km. The origin of this long-distance disjunction is not clear at present. Three likely hypotheses are: (1) long-distance dispersal via birds; (2) dispersal through sea currents; and (3) extinction of geographical intermediates in Malaysia and South Asia. The fruits of *A. chinensis* var. *longibractea* have been recorded to be eaten by birds (*Chai S.35356*, MO).

Paratypes. MALAYSIA. **Sabah:** Mt. Kinabalu, Ulu Liwagu and Ulu Mesilau, 3,500 ft., *Chew et al. 2626* (B, L, LE); Kiau, Mt. Kinabalu, *Clemens 10284* (A, UC); Kota Belue, Mt. Templer, near boundary overlooking Sungei Talupit, 700 ft., *Shea & Minjulu s.n.* (L); Ranau District, Ranau Rd., 7 km E of Ranau town, *Stone 12909* (KLU, MO). **Sarawak:** Bakelalan, 3,000 ft., *Brooke 10399* (BM, G, L); Kelabit Highlands, Bario, tanah rangoon, 1,000 m, *Nooteboom & Chai 01728* (B, L).

Aralia gintungensis C. Y. Wu ex K. M. Feng var. **multinervis** J. Wen, var. nov. TYPE: Burma. Upper Burma, *R. J. Farrer 1428*, cultivated in L. de Rothchild, Exbury, U.K., 15 Sep. 1933, *M. A. Bedford H. 2113/33* (holotype, K; isotypes, K[4]).

Foliola nervis lateralibus utroque costae latere 10–13, pubentia, glauca in pagina inferiore. Inflorescentia pubens.

Tree up to 10 m tall. Young branches purplish, with conical slender prickles. Leaves 35–70 cm long, with 2–3 pairs of pinnae, each 3–11-foliolate; petioles unarmed, 20–27 cm long; leaflets subcoriaceous, 5.5–10 cm long, 2–4 cm wide, narrowly ovate, acuminate at apex, rounded to obtuse at base, serrate, lateral veins 10–13 pairs, adaxial surface green, rugose, sparsely scabrous, abaxial surface glaucous, pubescent, with conspicuous veins and veinlets, petiolules 1–6 mm long, pubescent. Inflorescence 30–45 cm long, branching in 2 orders, primary branches 12–35 cm long, bracts and bracteoles narrowly triangular, clasping, furfuraceous and ciliate, primary bracts 10–13 mm long, secondary ones 4.5–8.5 mm long, bracteoles 3–6 mm long. Floral buds green. Flowers 10–15 in umbels, pedicels 4–6 mm long, furfuraceous. Styles slightly connate at base.

Phenology. Collected in mid-September in early anthesis.

Distribution. Only known from Upper Burma.

This variety is distinguished from *A. gintungensis* var. *gintungensis* by its 10–13 (vs. 5–8) pairs of lateral veins, pubescent and glaucous (vs. densely tomentose and brownish to grayish) abaxial leaflets, and its pubescent (vs. tomentose and sometimes hirsute near the base) inflorescence.

Aralia elata (Miquel) Seemann var. **inermis** (Yanagita) J. Wen, comb. nov. Basionym: *Aralia hypoleuca* Presl var. *inermis* Yanagita, J. Jap. Forestry Soc. 19: 340. 1937. *Aralia bipinnata* Blanco var. *inermis* (Yanagita) Yamazaki, J. Jap. Bot. 62: 190. 1987. TYPE: Japan. Pref. Tokyo: Izu-sichito (holotype not located).

Distribution. Izu Archipelago of Japan.

This taxon has been treated as *Aralia bipinnata* (= *A. hypoleuca;* Yamazaki, 1987). It lacks a number of characteristics typical of *A. bipinnata*, suggesting that it should not be placed there; these features include: crenate leaflet margin, few umbels on secondary inflorescence branches (1–5 vs. 7–many), and very short styles (0.6–0.7 vs. 1–1.2 mm). On the other hand, this variety shares the following characteristics with *A. elata:* lack of a main inflorescence axis or sometimes with a very short one (less than 10 cm long), serrulate to serrate leaflet margin, usually more umbels (more than 7) on secondary inflorescence branches, and longer styles (1–1.2 mm long at anthesis). Based on these considerations, this variety is better placed within *A. elata*. The type of this taxon has not been located.

Additional specimens examined. JAPAN. **Tokyo:** Kozu-shima Island, Izu Archipelago, *Ohba 2988* (TI); Isl. Aoga-shima, Isls. Izu, en route from Yasundo-go to Hamaji along the somma ridge, Aogashima-mura, *Kato & Miki 22-a* (TI).

Aralia elata (Miquel) Seemann var. **mandshurica** (Ruprecht & Maximowicz) J. Wen, comb. et stat. nov. Basionym: *Aralia mandshurica* Ruprecht & Maximowicz, Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint-Petersbourg 15: 134. 1857. *Dimorphanthus mandshuricus* (Ruprecht & Maximowicz) Ruprecht & Maximowicz, Mem. Acad. Imp. Sci. St.-Petersbourg Divers Savans 9: 133. 1859. *Aralia mandschurica* (Ruprecht & Maximowicz) Seemann, J. Bot. 6: 134. 1868. nom. illeg. *Aralia chinensis* L. var. *mandshurica* (Ruprecht & Maximowicz) Rehder in Bailey, Cycl. Amer. Hort. 1: 88. 1900. TYPE: On the lower Amur, 29 July 1855, *C. J. Maximowicz s.n.* (lectotype, inflorescence only, selected here, LE; isolectotypes, BM, LE, leaves only).

Distribution. In Hebei, Helongjiang, and Jilin provinces of China, Korea, and eastern Russia.

Seemann (1868) made the combination *Aralia mandschurica* (Ruprecht & Maximowicz) Seemann based on *Dimorphanthus mandshuricus*, apparently unaware of the original description of this taxon as *Aralia mandshurica* (1857). Rehder (1900) also regarded *Dimorphanthus mandshuricus* as the basionym of his *Aralia chinensis* var. *mandshurica*. An orthographic variant as *Aralia manshurica* Ruprecht & Maximowicz appeared in Komarov (1907: 123).

Additional specimens examined. CHINA. Chihli, *Chanet 83* (A); Hsiaoling State Forest, *Skvortzov s.n.* (A). **Hebei:** Eastern Tomb, 1,200 m, *Li 10058* (NY), *Tsai 50222* (A). **Heilongjiang:** Harbin, *Skvortzov s.n.* (A). **Jilin:** Huadian, Changshan Tun, Chao-yang-gou, 500–800 m, *Ma 51* (PE); Changbai Shan, Manjiang, 1,000 m, *Qian 814* (PE); Jiaohe Xian, Shuan-shan-tou village, *Zhou & Fu 2281* (PE). CHINA–RUSSIA. **Amur:** *Korshinsky s.n.* (A), 1859, *Maximowicz s.n.* (G, NY). KOREA. Shinkabachin, between Heizanchin and Chochin, S Hankyo–N Heian divide, *Wilson 9096* (A). **Hogen:** Hongo-san, *Wilson 10691* (A). RUSSIA. **Primorski Krai:** valley of river Suifun near the village of Nezhin, *Nefedova & Pashchenko s.n.* (LE), *Palczewsky s.n.* (LE); near Vladivostok, *Popov 1382* (LE), *Sargent s.n.* (A), *Topping 2424* (A); valley of river Suifun, *Vasilev et al. s.n.* (MO).

Aralia elata (Miquel) Seemann var. **ryukyuensis** J. Wen, var. nov. TYPE: Japan. Okinawa: Kunigami, near mura Taihofukujiyama, between Shioya wan and Taira wan, 27 July 1951, *E. H. Walker, S. Sonohara, S. Tawada & T. Amano 7151* (holotype, GH; isotype, UC).

Folia bipinnata; foliola chartacea–subcoriacea, anguste ovata–lanceolata, 5–10 cm longa, 2.5–5.5 cm lata, glabra in superficiebus ambabus, apice anguste acuminata–acuminata. Pedicelli 1–2 mm longi.

Shrubs 2–3 m tall. Leaves bipinnate, with 3–4 pairs of pinnae, each 5–17-foliolate; petioles glabrous, unarmed or slightly prickly at base, with many lenticel-like scars, 18–25 cm long; rachises unarmed, glabrous; leaflets narrowly ovate to ovate, 5–10 cm long, 2.5–5.5 cm wide, chartaceous to subcoriaceous, long acuminate to acuminate at apex, rounded to obtuse, rarely subcordate at base, margins serrulate to serrate, sometimes teeth slightly rounded, lateral veins 7–9 pairs, adaxial surfaces green, glabrous, abaxial surfaces glaucous, glabrous, petiolules 1–8 mm long. Inflorescence without a main axis, branching in 3 orders, primary branches 30–35 cm long, pubescent, secondary branches pubescent, 5–12 cm long, each with 9–many, rarely 7, umbels, tertiary branches consisting of one umbel; secondary bracts narrowly triangular, ciliate, 5–7 mm long, bracteoles lanceolate, ciliate, 2–2.5 mm long. Umbels with ca. 10 flowers, pedicels 1–2 mm long, pilose. Filaments ca. 2.5 mm long; anthers oblong, 1–1.3 mm long. Styles distinct, erect, 1–1.2 mm long at anthesis.

Vernacular names. Urajiro-taranoki (white beneath [leaved] *Aralia*).

Phenology. Flowering from July to August.

Distribution. Ryukyu Islands of Japan; on edges of forests; 100–300 m.

This variety has a controversial taxonomic history. Hatusima (1975: 447) treated plants from the Ryukyu Islands as *Aralia elata.* Walker (1976: 787) considered them as *A. bipinnata.* These plants are, however, distinguished from *Aralia bipinnata* by their serrulate to serrate (vs. sparsely crenate) leaflet margins, more umbels on secondary inflorescence branches (7–many vs. 1–5), shorter pedicels (1–2 vs. 4.5–10 mm), and longer styles (1–1.2 vs. 0.6–0.7 mm). However, they share the characteristics of *A. elata*, as described under *A. elata* var. *inermis*, and are therefore treated as part of *A. elata.*

Paratypes. JAPAN. **Kagoshima:** Isl. Tokunoshima, interior of Boma, Tokunoshima-cho, Ooshima-gun, 100–300 m, *Iwatsuki et al. 532* (MO). **Okinawa:** *Ameno 6693* (A). Locality unknown, *Yokohama Nursery Co. s.n.* (A).

KEY TO THE VARIETIES OF *ARALIA ELATA*

1a. Abaxial leaflet surface glabrous or nearly so.
  2a. Leaflet chartaceous, glabrous on both surfaces, pedicels short, ca. 1–3 mm long.
    3a. Leaves bipinnate, leaflet narrowly ovate to lanceolate ..... *Aralia elata* var. *ryukyuensis*
    3b. Leaves tripinnate, leaflet broadly ovate to rounded, occasionally ovate ..... *Aralia elata* var. *inermis*
  2b. Leaflet membranaceous, glabrous on both surfaces or slightly pilose on veins, pedicels relatively long, 5–10 mm ..... *Aralia elata* var. *mandshurica*
1b. Abaxial leaflet surface pubescent or sometimes becoming glabrescent, leaves bipinnate, leaflets chartaceous, pedicels 1–6 mm long ..... *Aralia elata* var. *elata*

Aralia bipinnata Blanco var. **apoensis** (Elmer) J. Wen, comb. et stat. nov. Basionym: *Aralia apoensis* Elmer, Leafl. Philipp. Bot. 7: 2325. 1914. TYPE: Philippines. Mindanao: Davao, Todaya (Mt. Apo), 1909, *A. D. E. Elmer 11608* (holotype, A; isotypes, BISH not seen, BM, E, GH, L, LE, MO, NSW not seen, NY, W).

Distribution. Endemic to Mt. Apo of Mindanao, the Philippines; in forests; 1,200–2,300 m.

This taxon is distinguished from the typical variety by its pubescent abaxial leaflet surface or at least the nerves soft brownish tomentose (vs. glabrous) and shorter pedicels (1–3.5 mm vs. 4.5–10 mm).

Additional specimens examined. PHILIPPINES. **Mindanao:** Mt. Apo, Lake Linao, 2,300 m, *Edanao 1392* (A, L), *Clemens 1903* (L, NY, UC).

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Literature Cited

Hatusima, S. 1975. Flora of the Ryukyus (Including Amami Islands, Okinawa Islands, and Sakishima Archipelago). Okinawa Association for Biology Education, Okinawa. [In Japanese.]

Hoo, G. & C. J. Tseng. 1978. Angiospermae, Dicotyledoneae, Araliaceae. *In:* Flora Reipublicae Popularis Sinicae, Vol. 54. Science Press, Beijing. [In Chinese.]

Komarov, V. L. 1907. Flora Manshuriae, Vol. 3. Petropoli [St. Petersburg].

Li, H. L. 1942. The Araliaceae of China. Sargentia 2: 1–134.

Ling, Y. R. 1977. Materials for the Araliaceae from Kwangtung. Acta Phytotax. Sin. 15(2): 84–86. [In Chinese.]

Miquel, F. A. W. 1856. Araliacearum indicarum genera et species aliquod novae. Bonplandia 4: 137–139.

Rehder, H. 1900. *Aralia. In:* L. H. Bailey, Cyclopedia of American Horticulture, 1: 87–88. MacMillan, London.

Seemann, B. 1868. Revision of the natural order Hederaceae. L. Reeve, London.

Shang, C. B. 1985. Araliaceae. *In:* W. C. Cheng (editor), Silva Sinica 2: 1720–1823. Chinese Forestry Press, Beijing.

Walker, E. H. 1976. Flora of Okinawa and the Southern Ryukyu Islands. Smithsonian Institution Press, Washington, D.C.

Wen, J. 1993. Generic delimitation of *Aralia* (Araliaceae). Brittonia 45: 47–55.

Yamazaki, T. 1987. On *Aralia bipinnata* Blanco and *A. hypoleuca* Presl. var. *inermis* Yanagita. J. Japan. Bot. 62: 189–190. [In Japanese.]

Lectotypification and Epitypification of *Dracontium gigas* (Seemann) Engler (Araceae)

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ABSTRACT. No type was designated in the protologue of *Godwinia gigas* Seemann, the basionym of *Dracontium gigas* (Seemann) Engler. The only herbarium collection mentioned in the original description cannot be located, and the surviving original material consists of a plate with three distinct elements. One of these elements is here designated the lectotype of *Godwinia gigas*. Since neither the lectotype nor the other two elements on the plate are identifiable to species, the type is ambiguous and not of practical utility for the precise application of the name. The *Tokyo Code* provides a mechanism for unequivocally fixing the application of a name in cases where the holotype or lectotype does not suffice to do so. Article 9.7 permits the designation of an interpretative *epitype*, comprising an element considered representative by the monographer. Several herbarium collections were prepared from a cultivated plant collected by the author when *G. gigas* was described. One of these, a fertile specimen prepared by N. E. Brown, is here designated an epitype.

Dracontium gigas (Seemann) Engler was discovered by Berthold Seemann between the Javalí Gold Mine and the Quebrada de Las Lajas in the Chontales Mountains of Nicaragua in January 1869. Seemann collected a spadix and two living tubers. He preserved the spadix in spirit and deposited it at the British Museum; he sent the tubers to William Bull in Chelsea, England. In a letter to Bull in the Gardeners' Chronicle for 1869 (p. 220), Seemann described one of the plants he found in Nicaragua. Seemann (1869) published a Latin description of the plant under the name *Godwinia gigas*, in honor of George Godwin, an eminent architect and major supporter of many scientific activities in England at that time. He also included an English description and a plate with details of various organs (Fig. 1), but the taxon was mistakenly referred to "*B. gigas*." In 1879, Engler synonymized *Godwinia* with *Dracontium*, and made the combination *D. gigas* (Seemann) Engler.

One of the cultivated plants collected by Seemann from Nicaragua flowered for the first time at Bull's establishment in December 1872, at which time a detailed drawing was made by W. Fitches (Hooker, 1873). Another drawing of the same inflorescence was made by W. G. Smith and published by M. T. Masters (1873), along with some measurements and observations of the plant. Both figures depict a fully opened inflorescence. No herbarium vouchers of this inflorescence were prepared, and only parts of the spadix were preserved in spirit. These spadix parts were later affixed to one of the sterile sheets collected from the same plant (*N. E. Brown s.n.*, 1878, K). Three years later Brown (*s.n.*, 1881, K, GH) prepared a second sterile collection from this plant. Apparently, the Royal Botanic Gardens obtained one of these plants from Bull before 1883, because a third sterile collection was prepared at Kew in 1883. Curiously, this collection is presently housed in the Gray Herbarium at Harvard University (*N. E. Brown s.n.*, 1883, GH). Bull's plant bloomed for the second time in 1884, and a fertile collection was then prepared (*N. E. Brown s.n.*, 1884, K). In 1889, a fertile collection, which is believed to be from the same plant, was prepared and housed in K. Finally, in 1901, the plant that had been collected by Seemann 38 years previously bloomed once again at Kew, and some details of it were studied by W. Watson (1901) and published with a photograph.

LECTOTYPIFICATION AND EPITYPIFICATION

In the protologue of *Godwinia gigas* Seemann, no type was designated. The only surviving original material is a plate, reproduced here as Figure 1, comprising three separate elements. In the following discussion, numbers in parentheses are those of the figures in the original plate. The leaf (1) was drawn by W. G. Smith from the live plant grown by William Bull and was obviously erroneous since the branching pattern of the middle section as depicted is unknown in the genus. The spathe and tuber (2, 3) were adapted from a sketch by Antonio Fairburn made in Nicaragua. The details of flowers (6–17) were drawn by H. Trimen from the spadix deposited at BM. This pickled spadix was the only herbarium

Figure 1. Reproduction of Seemann, 1869. J. Bot. 7: Tab. 96 and 97, f. 1. The leaf is designated here as lectotype of the name *Godwinia gigas* Seemann and consequently of *Dracontium gigas* (Seemann) Engler.

collection among the original material and is believed to be no longer extant (R. Vickery, pers. comm.).

The sketches of the spathe and tuber (2, 3) were probably made from a plant that Seemann had not seen. The spathe bears no resemblance to any known species of *Dracontium*, and the tuber, presumably from the same plant, is not unique to *Dracontium*. Thus it is conceivable that more than one taxon may be represented in the original plate. Since the leaf of *D. gigas* is identical to that of *D. pittieri*, the leaf (1) is inadequate to determine the species. The only useful character in the floral details is in the styles (9, 10), which are almost as long as the tepals; this feature, however, is shared with *D. pittieri*, which is distinct from *D. gigas* by having a much longer peduncle, a much larger transparent area inside the spathe, and in various ultrastructural characters of the spathe. Thus, none of the three elements in the plate is identifiable to the species level; whether taken individually or together, they are ambiguous and useless for the precise application of the name *Dracontium gigas*. Nonetheless, the *International Code of Botanical Nomenclature* (Greuter et al., 1988, Articles 7.4 and 7.5) requires

Figure 2. Epitype of *Dracontium gigas* (Seemann) Engler (*N. E. Brown s.n.*, 3/19/1884, K). Photo by Thomas B. Croat (262-14).

that a lectotype be chosen from the original material and precludes neotypification when such material is extant. Thus, a lectotype has to be chosen from among the three elements comprising Seemann's plate. Despite the branching error of the middle section, the leaf drawing (1) depicts adequate details and represents a distinctive leaf form, which at least narrows the field to two species in the genus. Thus, the drawing of a leaf (1) is here selected as the lectotype for the name *Godwinia gigas*.

The most recent Code, the *Tokyo Code* (Greuter et al., 1994), provides a mechanism for unequivocally fixing the application of a name in cases, such as this, where the holotype or lectotype does not suffice to do so. Article 9.7 permits the designation of an interpretative type, called an "epitype," com-

prising an element considered representative by the monographer. Clearly, *Godwinia gigas* is a prime candidate for epitypification. From among the herbarium collections prepared from the cultivated plants that were collected by the original author when the species was described, the only fertile specimen (*N. E. Brown s.n.*, 3/19/1884, K) is here designated as the epitype of the name *Godwinia gigas* Seemann and consequently of *Dracontium gigas* (Seemann) Engler (Fig. 2).

Dracontium gigas (Seemann) Engler in DC., Monogr. Phan. 2: 284, 1889. *Godwinia gigas* Seemann, J. Bot. 7: 313–315. t. 96 & 97, 1869. LECTOTYPE: Figure 1 in J. Bot. 7: t. 96 and 97. 1869. EPITYPE: Cultivated plant in Royal Botanic Gardens, Kew, originally collected by Seemann between the Javalí Gold Mine and the Quebrada de Las Lajas, Chontales, Nicaragua, *N. E. Brown s.n.* 3/19/1884 (K).

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Literature Cited

Engler, A. 1879. Araceae. *In:* A. P. De Candolle, Monographiae Phanerogamarum, II: 284–285. G. Masson, Paris.

———. 1889. Araceae. *In:* A. Engler & K. Prantl, Die Natürlichen Pflanzenfamilien, II (3): 124–125. Leipzig.

———. 1911. Araceae–Lasioideae. *In:* A. Engler, Das Pflanzenreich IV. 23C (Heft 48): 46–47.

Greuter, W. G., F. R. Barrie, H. M. Burdet, W. G. Chaloner, V. Demoulin, D. L. Hawksworth, P. M. Jørgensen, D. H. Nicolson, P. C. Silva, R. P. Trehane & J. McNeill. Editors. 1994. International Code of Botanical Nomenclature (The Tokyo Code), Adopted by the XVth International Botanical Congress, Yokohama, August–September, 1993.

———, H. M. Burdet, W. G. Chaloner, V. Demoulin, R. Grolle, D. L. Hawksworth, D. H. Nicolson, P. C. Silva, F. A. Stafleu, E. G. Voss & J. McNeill. Editors. 1988. International Code of Botanical Nomenclature, Adopted by the Fourteenth International Botanical Congress, Berlin, July–August 1987. Regnum Veg. 118: 7–8.

Hooker, J. D. 1873. *Godwinia gigas*. Bot. Mag. 99: t. 6048.

Macmillan, H. F. 1956. P. 131 *in* Tropical Planting and Gardening, 5th ed. Macmillan, London.

Masters, M. T. 1873. Arads. Gard. Chron. 18: 72–73.

Seemann, B. 1869. On the gigantic new aroidea from Nicaragua (*Godwinia gigas* Seemann). J. Bot. 7: 313–315.

Watson, W. 1901. *Dracontium gigas*. The Garden, 1901: 241.

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